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PATENT
4450-0358P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Chiradeep VITTAL et al. Conf.: 9959
Appl. No.: 10/027,916 Group: 2872
Filed: December 20, 2001 Examiner: Unknown
For: SYSTEM TO OPTIMIZE RECEIVED POWER IN AN
OPTICAL NETWORK

REVOCATION OF POWER OF ATTORNEY, SUBSTITUTE POWER
OF ATTORNEY, AND CHANGE IN CORRESPONDENCE ADDRESS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Assignee of the above-identified patent application, CIENA Corporation having a business office at 1201 Winterson Road, Linthicum, MD 21090, as evidenced by the enclosed Certificate Under 37 C.F.R. § 3.73(b) showing chain of title, hereby revokes any and all previous powers of attorney for the above-identified patent application or issued patent, and hereby appoints the practitioners at CUSTOMER NO. 02292 (BIRCH, STEWART, KOLASCH & BIRCH, LLP) as the attorneys of the Assignee to receive all correspondence relating to the above-identified application or patent and to transact all business in the United States Patent and Trademark Office connected therewith, with full power of substitution and revocation, and the Assignee ratifies any act done by the Assignee's attorneys in respect of this patent.

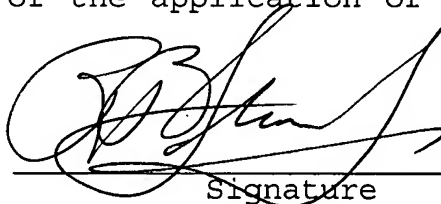
The new correspondence address is:

BIRCH, STEWART, KOLASCH & BIRCH, LLP or Customer No. 02292
P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

The undersigned (whose title is supplied below) is empowered to sign this Revocation and Substitute Power of Attorney on behalf of the Assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

4/2/04
Date


Signature

Russell B. Stevenson, Jr.

Typed or printed name

Senior Vice President
General Counsel & Secretary
CIENA Corporation

Title

Enclosure: Certificate Under 37 C.F.R. § 3.73(b)
showing chain of title.



PATENT
4450-0358P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Chiradee VITTAL et al. Conf. 9959
Appl. No.: 10/027,916 Group: 2872
Filed: December 20, 2001 Examiner: Unknown
For: SYSTEM TO OPTIMIZE RECEIVED POWER IN AN
OPTICAL NETWORK

CERTIFICATE UNDER 37 C.F.R. § 3.73(b)
SHOWING CHAIN OF TITLE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

CIENA Corporation, a corporation certifies that it is the assignee of the patent application or issued patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application or issued patent identified above. The assignment was recorded in the Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

- OR -

B. ☒ A chain of title from the inventor(s), of the patent application or issued patent identified above, to the current assignee as shown below:

1. From: ONI SYSTEMS CORPORATION
To: CIENA Corporation
The document was filed in the Patent and Trademark Office on March 8, 2004, for which a copy thereof is attached.

2. From: Chiradeep VITTAL and Gopesh GARG
To: ONI SYSTEMS CORPORATION
The document was recorded in the Patent and Trademark
Office at Reel 12791, Frame 455-457.

- ☐ Additional documents in the chain of title are attached.
- ☐ Copies of assignments or other documents in the chain of
title are attached

The undersigned has reviewed all the documents in the chain
of title of the patent application or issued patent identified
above and, to the best of undersigned's knowledge and belief,
title is in the assignee identified above.

The undersigned (whose title is supplied below) is empowered
to sign this certificate on behalf of the assignee.

I hereby declare that all statements made herein of my own
knowledge are true and that all statements made on information and
belief are believed to be true; and further that these statements
were made with the knowledge that willful false statements and the
like so made are punishable by fine or imprisonment, or both,
under Section 1001 of Title 18 of the United States Code and that
such willful false statements may jeopardize the validity of the
application or any patent issued thereon.

4/2/04
Date


Signature

Russell B. Stevenson, Jr.
Typed or printed name

Senior Vice President
General Counsel & Secretary
CIENA Corporation
Title

RECORDATION FORM COVER SHEET

To the Director of the U.S. Patent and Trademark Office:
Please record the attached original documents or copy thereof.

1. Name of conveying party(ies):

ONI SYSTEMS CORPORATION

Additional name(s) of conveying party(ies) attached?
☐ YES ☒ NO

3. Nature of conveyance:

☐ Assignment

☒ Merger

Execution Date: June 21, 2002

2. Name and address of receiving party(ies)

Name: CIENA Corporation

Internal Address:

Street Address: 1201 Winterson Road

City: Linthicum State: MD ZIP: 21090

Country: USA

Postal Code:

Additional name(s) & address(es) attached? ☐ YES ☒ NO

4. Application number(s) or patent number(s):

If this document is being filed together with a new application, the execution date of the application is:

A. Patent Application No(s).

10/161,217

09/933,991

09/855,822

10/027,916

B. Patent No.(s).

Additional numbers attached? ☐ YES ☒ NO

5. Name and address of party to whom correspondence concerning document should be mailed:

Name: BIRCH, STEWART, KOLASCH & BIRCH, LLP

Street Address: P.O. BOX 747

City: FALLS CHURCH State: VA ZIP: 22040-0747

Country: USA

6. Total No. of applications/patents involved: four (4)

7. Total fee (37 C.F.R. § 3.41): \$160.00

☒ Enclosed

☒ Authorized to be charged to deposit account, if no fee attached.

8. Deposit account number: 02-2448

(Attach triplicate copy of this page if paying by deposit account)

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9. Statement and signature.

Michael R. Cammarata, #39,491

Name of Person Signing/Reg. No.

Signature

March 8, 2004

Date

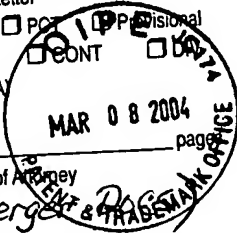
Total number of pages including cover sheet, attachments, and document: sixty (60)



Papers Filed herewith on: March 8, 2004 16
DOCKET NO.: 4450-0100M ATTY.: MPC

Appln. Nos: 10/161,217
09/933,991
09/855,822
10/027,916

- ☐ New Application with Transmittal Letter
- ☐ Utility ☐ Design ☐ CIP ☐ PCT ☐ Provisional
- ☐ Filing Under 37 CFR 1.53(b) ☐ CONT ☐ B6
- ☐ Filing Under 37 CFR 1.53(d) (CPA)
- ☐ Filing Under 37 CFR 1.114(RCE)
- ☐ Specification Consisting of: _____ page(s)
- ☐ Combined Declaration & Power of Attorney
- ☒ Assignment / Cover Letter (Mergent & TRADEMARKS)
- ☐ Letter to Official Draftsman
- ☐ Drawings _____ Sheets ☐ Formal ☐ Informal ☐ Red-Ink
- ☐ Completion of Filing Requirements, PCT/DO/EO/905 or Formalities Letter and Executed Declaration
- ☐ Priority Document(s) / Cover Letter, No. Doc. _____
- ☐ Amendment:
 - ☐ Transmtl Ltr ☐ Large Entity ☐ Small Entity
- ☐ Response
- ☐ Information Discd Stmtnt. PTO-1449(s) _____ ref(s)
- ☐ Notice of Appeal ☐ Appeal Brief
- ☐ Issue Fee Transmittal
- ☒ FEES: \$160.00 (Ct. no. 9013906)
- ☐ Letter: _____
- ☐ Other: _____



DOCKET NO. 4450-0100M

Receipt is hereby acknowledged of the papers filed as indicated in connection with the above identified case.
COMMISSIONER OF PATENTS AND TRADEMARKS
Due Date: _____
Handcarry: _____

Delaware

PAGE 1

The First State

I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF MERGER, WHICH MERGES:

"ONT SYSTEMS CORP.", A DELAWARE CORPORATION,

WITH AND INTO "CIENA CORPORATION" UNDER THE NAME OF "CIENA CORPORATION", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE TWENTY-FIRST DAY OF JUNE, A.D. 2002, AT 1:30 O'CLOCK P.M.

AND I DO HEREBY FURTHER CERTIFY THAT THE EFFECTIVE DATE OF THE AFORESAID CERTIFICATE OF MERGER IS THE TWENTY-FIRST DAY OF JUNE, A.D. 2002, AT 11:59 O'CLOCK P.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.



Harriet Smith Windsor
Harriet Smith Windsor, Secretary of State

2314539 8100M

020402001

AUTHENTICATION: 1845589

DATE: 06-21-02

**CERTIFICATE OF MERGER
OF**

**ONI SYSTEMS CORP.,
a Delaware Corporation**

WITH AND INTO

**CIENA CORPORATION,
a Delaware Corporation**

STATE OF DELAWARE
SECRETARY OF STATE
DIVISION OF CORPORATIONS
FILED 01:30 PM 06/21/2001
020403001 - 1316529

The undersigned corporation DOES HEREBY CERTIFY:

FIRST: That the name and state of incorporation of each of the constituent corporations of the merger is as follows:

<u>NAME</u>	<u>STATE OF INCORPORATION</u>
CIENA Corporation	Delaware
ONI Systems Corp.	Delaware

SECOND: That an agreement of merger between the constituent corporations has been approved, adopted, certified, executed and acknowledged by each of the constituent corporations in accordance with the requirements of Section 251 of the General Corporation Law of the State of Delaware.

THIRD: That the name of the surviving corporation of the merger is
CIENA Corporation.

FOURTH: That the certificate of incorporation of CIENA Corporation, a Delaware corporation, the surviving corporation, shall be the certificate of incorporation of the surviving corporation.

FIFTH: That the executed agreement of merger is on file at the principal place of business of the surviving corporation. The address of the principal place of business of the surviving corporation is 1201 Winterson Road, Linthicum, MD 21090.

SIXTH: That a copy of the agreement of merger will be furnished by the surviving corporation, on request and without cost, to any stockholder of each of the constituent corporations.

SEVENTH: The effective date of the merger shall be as of 11:59 p.m. Eastern Time on June 21, 2002.

IN WITNESS WHEREOF, CIENA Corporation, a Delaware corporation, has caused this certificate to be signed by Russell B. Stevenson, Jr., its Senior Vice President, General Counsel and Secretary, an authorized officer of the corporation, this 21st day of June, 2002.

CIENA Corporation,
a Delaware corporation

By: 

Russell B. Stevenson, Jr.
Senior Vice President, General
Counsel and Secretary

U I P E
JAN 16 2003
U I P E

PTO/SB/92 (08-00)

Approved for use through 10/31/2002. OMB 0551-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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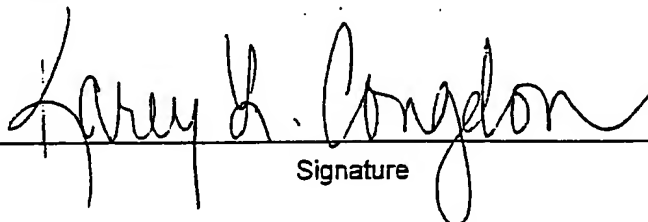
Certificate of Mailing under 37 CFR 1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

**Assistant Commissioner for Patents
Washington, D.C. 20231**

on October 18, 2002

Date


Signature

Karey L. Congdon

Typed or printed name of person of signing Certificate

Note: Each paper must have its own certificate of mailing, or this certificate must identify each submitted paper.

Burden Hour Statement: This form is estimated to take 0.03 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U. S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Office of the Secretary of State

I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF INCORPORATION OF "ONI SYSTEMS CORP.", FILED IN THIS OFFICE ON THE TWENTY-FOURTH DAY OF FEBRUARY, A.D. 2000, AT 9 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE KENT COUNTY RECORDER OF DEEDS.




Edward J. Freel, Secretary of State

3177050 8100

001092105

AUTHENTICATION: 0276965

DATE: 02-24-00

CERTIFICATE OF INCORPORATION

OF

ONI SYSTEMS CORP.

ARTICLE I

The name of the corporation is ONI Systems Corp.

ARTICLE II

The address of the registered office of the corporation in the State of Delaware is 15 East North Street, City of Dover, County of Kent. The name of its registered agent at that address is Incorporating Services, Ltd.

ARTICLE III

The purpose of the corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

ARTICLE IV

The total number of shares of stock which the corporation has authority to issue is One Thousand (1,000) shares, all of which shall be Common Stock, \$0.001 par value per share.

ARTICLE V

The Board of Directors of the corporation shall have the power to adopt, amend or repeal the Bylaws of the corporation.

ARTICLE VI

Election of directors need not be by written ballot unless the Bylaws of the corporation shall so provide.

ARTICLE VII

To the fullest extent permitted by law, no director of the corporation shall be personally liable for monetary damages for breach of fiduciary duty as a director. Without limiting the effect of the preceding sentence, if the Delaware General Corporation Law is hereafter amended to authorize the further elimination or limitation of the liability of a director, then the liability of a director of the corporation shall be eliminated or limited to the fullest extent permitted by the Delaware General Corporation Law, as so amended.

Neither any amendment nor repeal of this Article VII, nor the adoption of any provision of this Certificate of Incorporation inconsistent with this Article VII, shall eliminate, reduce or otherwise adversely affect any limitation on the personal liability of a director of the corporation existing at the time of such amendment, repeal or adoption of such an inconsistent provision.

ARTICLE VIII

The name and mailing address of the incorporator is Steven S. Levine, c/o Fenwick & West LLP, Two Palo Alto Square, Palo Alto, California 94306.

The undersigned incorporator hereby acknowledges that the foregoing certificate is his act and deed and that the facts stated herein are true.

Dated: February 24, 2000


Steven S. Levine, Incorporator

AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
ONI SYSTEMS CORP.


(Originally incorporated on February 24, 2000)

ONI Systems Corp., a Delaware corporation, hereby certifies that the Amended and Restated Certificate of Incorporation of the corporation attached hereto as Exhibit "A", which is incorporated herein by this reference, has been duly adopted by the corporation's Board of Directors and stockholders in accordance with Sections 242 and 245 of the Delaware General Corporation Law, with the approval of the corporation's stockholders having been given by written consent without a meeting in accordance with Section 228 of the Delaware General Corporation Law.

IN WITNESS WHEREOF, said corporation has caused this Amended and Restated Certificate of Incorporation to be signed by its duly authorized officer.

Dated: June 6, 2000

ONI Systems Corp.



Michael A. Dillon,
Vice President, General Counsel
and Secretary

AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
ONI SYSTEMS CORP.

ARTICLE I

The name of the corporation is ONI Systems Corp.

ARTICLE II

The address of the registered office of the corporation in the State of Delaware is 15 East North Street, City of Dover, County of Kent. The name of its registered agent at that address is Incorporating Services, Ltd.

ARTICLE III

The purpose of the corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

ARTICLE IV

The total number of shares of all classes of stock which the corporation has authority to issue is 710,000,000 shares, consisting of two classes: 700,000,000 shares of Common Stock, \$0.0001 par value per share, and 10,000,000 shares of Preferred Stock, \$0.0001 par value per share.

The Board of Directors is authorized, subject to any limitations prescribed by the law of the State of Delaware, to provide for the issuance of the shares of Preferred Stock in one or more series, and, by filing a Certificate of Designation pursuant to the applicable law of the State of Delaware, to establish from time to time the number of shares to be included in each such series, to fix the designation, powers, preferences and rights of the shares of each such series and any qualifications, limitations or restrictions thereof, and to increase or decrease the number of shares of any such series (but not below the number of shares of such series then outstanding). The number of authorized shares of Preferred Stock may also be increased or decreased (but not below the number of shares thereof then outstanding) by the affirmative vote of the holders of a majority of the stock of the corporation entitled to vote, unless a vote of any other holders is required pursuant to a Certificate or Certificates establishing a series of Preferred Stock.

Except as otherwise expressly provided in any Certificate of Designation designating any series of Preferred Stock pursuant to the foregoing provisions of this Article IV, any new series of Preferred Stock may be designated, fixed and determined as provided herein by the Board of Directors without approval of the holders of Common Stock or the holders of Preferred Stock, or

any series thereof, and any such new series may have powers, preferences and rights, including, without limitation, voting rights, dividend rights, liquidation rights, redemption rights and conversion rights, senior to, junior to or pari passu with the rights of the Common Stock, the Preferred Stock, or any future class or series of Preferred Stock or Common Stock.

ARTICLE V

The Board of Directors of the corporation shall have the power to adopt, amend or repeal the Bylaws of the corporation.

ARTICLE VI

For the management of the business and for the conduct of the affairs of the corporation, and in further definition, limitation and regulation of the powers of the corporation, of its directors and of its stockholders or any class thereof, as the case may be, it is further provided that:

(A) The conduct of the affairs of the corporation shall be managed under the direction of the Board of Directors. The number of directors shall be fixed from time to time exclusively by resolution of the Board of Directors.

(B) Notwithstanding the foregoing provision of this Article VI, each director shall hold office until such director's successor is elected and qualified, or until such director's earlier death, resignation or removal. No decrease in the authorized number of directors constituting the Board of Directors shall shorten the term of any incumbent director.

(C) Election of directors need not be by written ballot unless the Bylaws of the corporation shall so provide.

(D) No action shall be taken by the stockholders of the corporation except at an annual or special meeting of stockholders called in accordance with the Bylaws of the corporation, and no action shall be taken by the stockholders by written consent.

(E) Advance notice of stockholder nominations for the election of directors of the corporation and of business to be brought by stockholders before any meeting of stockholders of the corporation shall be given in the manner provided in the Bylaws of the corporation. Business transacted at special meetings of stockholders shall be confined to the purpose or purposes stated in the notice of meeting.

(F) Subject to Section 6.5 of the Bylaws of the corporation, stockholders of the corporation holding at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors shall have the power to adopt, amend or repeal Bylaws of the corporation.

The affirmative vote of the holders of at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors,

voting together as a single class, shall be required to alter, change, amend, repeal or adopt any provision inconsistent with this Article VI.

ARTICLE VII

To the fullest extent permitted by law, no director of the corporation shall be personally liable for monetary damages for breach of fiduciary duty as a director. Without limiting the effect of the preceding sentence, if the Delaware General Corporation Law is hereafter amended to authorize the further elimination or limitation of the liability of a director, then the liability of a director of the corporation shall be eliminated or limited to the fullest extent permitted by the Delaware General Corporation Law, as so amended.

Neither any amendment nor repeal of this Article VII, nor the adoption of any provision of this Certificate of Incorporation inconsistent with this Article VII, shall eliminate, reduce or otherwise adversely affect any limitation on the personal liability of a director of the corporation existing at the time of such amendment, repeal or adoption of such an inconsistent provision.

The affirmative vote of the holders of at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors, voting together as a single class, shall be required to alter, change, amend, repeal or adopt any provision inconsistent with this Article VII.

State of Delaware

PAGE 1

Office of the Secretary of State

I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE RESTATED CERTIFICATE OF "ONI SYSTEMS CORP.", FILED IN THIS OFFICE ON THE SIXTH DAY OF JUNE, A.D. 2000, AT 9 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE KENT COUNTY RECORDER OF DEEDS.



Edward J. Freel
Edward J. Freel, Secretary of State

3177050 8100

001287571

AUTHENTICATION:

0481448

06-06-00

Office of the Secretary of State

I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AGREEMENT OF MERGER, WHICH MERGES:

"OPTICAL NETWORKS, INCORPORATED", A CALIFORNIA CORPORATION, WITH AND INTO "ONI SYSTEMS CORP." UNDER THE NAME OF "ONI SYSTEMS CORP.", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE TWENTY-FIFTH DAY OF APRIL, A.D. 2000, AT 9 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE KENT COUNTY RECORDER OF DEEDS.

3177050 8100M

001210551




Edward J. Freel, Secretary of State

AUTHENTICATION: 04-25-00

DATE

AGREEMENT AND PLAN OF MERGER

THIS AGREEMENT AND PLAN OF MERGER (this "*Merger Agreement*") is entered into as of April 25, 2000, by and between Optical Networks, Incorporated, a California corporation ("*ONI California*"), and ONI Systems Corp., a Delaware corporation ("*ONI Delaware*"). ONI California and ONI Delaware are hereinafter sometimes collectively referred to as the "*Constituent Corporations*".

RECITALS

A. ONI California was incorporated on October 20, 1997. Its current authorized capital stock consists of: (i) 159,690,592 shares of Common Stock, no par value ("*ONI California Common Stock*"), of which 34,943,875 shares are issued and outstanding; and (ii) 80,309,408 shares of Preferred Stock, no par value ("*ONI California Preferred Stock*"), of which 79,194,900 shares are issued and outstanding (consisting of 24,795,510 shares of Series B Preferred Stock, 2,733,332 shares of Series C Preferred Stock, 4,969,148 shares of Series D Preferred Stock, 26,284,024 shares of Series E Preferred Stock, 8,249,468 shares of Series F Preferred Stock and 12,163,418 shares of Series G Preferred Stock).

B. ONI Delaware was incorporated on February 24, 2000. Its authorized capital stock consists of 1,000 shares of Common Stock, with a par value of \$.001 per share ("*ONI Delaware Common Stock*"), of which 1,000 shares are issued and outstanding.

C. The respective Boards of Directors of ONI California and ONI Delaware deem it advisable and to the advantage of each of the Constituent Corporations that ONI California merge with and into ONI Delaware upon the terms and subject to the conditions set forth in this Merger Agreement for the purpose of effecting a change of the state of incorporation of ONI California from California to Delaware.

D. The Boards of Directors of each of the Constituent Corporations have approved this Merger Agreement.

NOW, THEREFORE, the parties do hereby adopt the plan of reorganization set forth in this Merger Agreement and do hereby agree that ONI California shall merge with and into ONI Delaware on the following terms, conditions and other provisions:

1. Merger and Effective Time. At the Effective Time (as defined below), ONI California shall be merged with and into ONI Delaware (the "*Merger*"), and ONI Delaware shall be the surviving corporation of the Merger (the "*Surviving Corporation*"). The Merger shall become effective upon the date hereof (the "*effective time*").

2. Effect of Merger. At the Effective Time, the separate corporate existence of ONI California shall cease; the corporate identity, existence, powers, rights and immunities of ONI

Delaware as the Surviving Corporation shall continue unimpaired by the Merger, and ONI Delaware shall succeed to and shall possess all the assets, properties, rights, privileges, powers, franchises, immunities and purposes, and be subject to all the debts, liabilities, obligations, restrictions and duties of ONI California, all without further act or deed.

3. Governing Documents. At the Effective Time, (a) the Certificate of Incorporation of ONI Delaware in effect immediately prior to the Effective Time shall be amended and restated by virtue of the Merger to read as set forth in full in Exhibit "A" hereto (the "First Restated Certificate"), and (b) the Bylaws of ONI Delaware in effect immediately prior to the Effective Time shall be amended and restated by virtue of the Merger as approved by the Board of Directors of ONI Delaware.

4. Directors and Officers. At the Effective Time, the directors of ONI Delaware shall be and become the directors of the Surviving Corporation, and the officers of ONI Delaware shall be and become the officers (holding the same offices) of the Surviving Corporation, and after the Effective Time shall serve in accordance with the First Restated Certificate and Bylaws of the Surviving Corporation.

5. Conversion of Shares of ONI California. At the Effective Time, by virtue of the Merger and without any further action on the part of the Constituent Corporations or their shareholders, (i) each share of ONI California Common Stock issued and outstanding immediately prior thereto shall be converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Common Stock, (ii) each share of ONI California Series B Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series B Preferred Stock, and (iii) each share of ONI California Series C Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series C Preferred Stock, and (iv) each share of ONI California Series D Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series D Preferred Stock, and (v) each share of ONI California Series E Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series E Preferred Stock, and (vi) each share of ONI California Series F Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series F Preferred Stock, and (vii) each share of ONI California Series G Preferred Stock outstanding immediately prior thereto shall be automatically changed and converted into one fully paid and nonassessable, issued and outstanding share of ONI Delaware Series G Preferred Stock.

6. Cancellation of Shares of ONI Delaware. At the Effective Time, by virtue of the Merger and without any further action on the part of the Constituent Corporations or their shareholders, all of the previously issued and outstanding shares of ONI Delaware Common

Stock that were issued and outstanding immediately prior to the Effective Time shall be automatically canceled and returned to the status of authorized but unissued shares.

7. Stock Certificates. At and after the Effective Time, all of the outstanding certificates that, prior to that date, represented shares of ONI California Common Stock shall be deemed for all purposes to evidence ownership of and to represent the number of shares of ONI Delaware Common Stock into which such shares of ONI California Common Stock are converted as provided herein. At and after the Effective Time, all of the outstanding certificates that, prior to that date, represented shares of a series of ONI California Preferred Stock shall be deemed for all purposes to evidence ownership of and to represent the number of shares of the series of shares of ONI Delaware Preferred Stock, into which such shares of ONI California Preferred Stock are converted as provided herein. The registered owner on the books and records of ONI California of any such outstanding stock certificate for ONI California Common Stock or ONI California Preferred Stock shall, until such certificate is surrendered for transfer or otherwise accounted for to ONI Delaware or its transfer agent, be entitled to exercise any voting and other rights with respect to, and to receive any dividend and other distributions upon, the shares of ONI Delaware Common Stock or ONI Delaware Preferred Stock evidenced by such outstanding certificate as provided above.

8. Assumption of Options and Warrants. At the Effective Time, all outstanding and unexercised portions of all options to purchase ONI California Common Stock under the ONI California 1997 Stock Option Plan, 1998 Equity Incentive Plan and 1999 Equity Incentive Plan (the "*Existing Plans*"), and all other outstanding options to purchase ONI California Common Stock, shall be assumed by ONI Delaware and become options to purchase the same number of shares of ONI Delaware Common Stock at the same exercise price per share and otherwise shall, to the extent permitted by law and otherwise reasonably practicable, have the same term, exercisability, vesting schedule, status as an "incentive stock option" under Section 422 of the Internal Revenue Code of 1986, as amended (the "*Code*"), if applicable, and all other material terms and conditions (including but not limited to the terms and conditions applicable to such options by virtue of the Existing Plans). Continuous employment with ONI California will be credited to an optionee for purposes of determining the vesting of the number of shares of ONI Delaware Common Stock subject to exercise under an assumed ONI California option at the Effective Time. At the Effective Time, ONI Delaware shall adopt and assume the Existing Plans. Additionally, at the Effective Time, all outstanding and unexercised portions of all warrants to purchase or acquire ONI California Common Stock or any series of ONI California Preferred Stock shall be assumed by ONI Delaware and become warrants to purchase or acquire the same number of shares of ONI Delaware Common Stock or the corresponding series of ONI Delaware Preferred Stock, as the case may be, at the same exercise price per share and otherwise with the same term, exercisability, and all other material terms and conditions.

9. Fractional Shares. No fractional shares of ONI Delaware Common Stock or ONI Delaware Preferred Stock will be issued in connection with the Merger.

10. Employee Benefit Plans. At the Effective Time, the obligations of ONI California under or with respect to every plan, trust, program and benefit then in effect or

administered by ONI California for the benefit of the directors, officers and employees of ONI California or any of its subsidiaries shall become the lawful obligations of ONI Delaware and shall be implemented and administered in the same manner and without interruption until the same are amended or otherwise lawfully altered or terminated. Effective at the Effective Time, ONI Delaware hereby expressly adopts and assumes all obligations of ONI California under such employee benefit plans.

11. Further Assurances. From time to time, as and when required by the Surviving Corporation or by its successors or assigns, there shall be executed and delivered on behalf of ONI California such deeds, assignments and other instruments, and there shall be taken or caused to be taken by it all such further action, as shall be appropriate, advisable or necessary in order to vest, perfect or confirm, of record or otherwise, in the Surviving Corporation the title to and possession of all property, interests, assets, rights, privileges, immunities, powers, franchises and authority of ONI California, and otherwise to carry out the purposes of this Merger Agreement. The officers and directors of the Surviving Corporation are fully authorized in the name of and on behalf of ONI California, or otherwise, to take any and all such actions and to execute and deliver any and all such deeds and other instruments as may be necessary or appropriate to accomplish the foregoing.

12. Condition. The consummation of the Merger is subject to the approval of this Merger Agreement and the Merger contemplated hereby by the shareholders of ONI California and by the sole stockholder of ONI Delaware, prior to or at the Effective Time.

13. Abandonment. At any time before the Effective Time, this Merger Agreement may be terminated and the Merger abandoned by the Board of Directors of ONI California or ONI Delaware, notwithstanding approval of this Merger Agreement by the shareholders of ONI California and the sole stockholder of ONI Delaware.

14. Amendment. At any time before the Effective Time, this Merger Agreement may be amended, modified or supplemented by the Boards of Directors of the Constituent Corporations, notwithstanding approval of this Merger Agreement by the shareholders of ONI California and the sole stockholder of ONI Delaware; provided, however, that any amendment made subsequent to the adoption of this Merger Agreement by the shareholders of ONI California or the sole stockholder of ONI Delaware shall not: (i) alter or change the amount or kind of shares, securities, cash, property and/or rights to be received in exchange for or upon conversion of any shares of any class or series of ONI California; (ii) alter or change any of the terms of the Certificate of Incorporation of the Surviving Corporation to be effected by the Merger; or (iii) alter or change any of the terms or conditions of this Merger Agreement if such alteration or change would adversely affect the holders of any shares of any class or series of ONI California or ONI Delaware.

15. Tax-Free Reorganization. The Merger is intended to be a tax-free plan of reorganization within the meaning of Section 368(a)(1)(F) of the Code.

16. Governing Law. This Merger Agreement shall be governed by and construed under the internal laws of the State of Delaware.


17. Counterparts. In order to facilitate the filing and recording of this Merger Agreement, it may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which together shall constitute one and the same instrument.

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IN WITNESS WHEREOF, the parties hereto have caused this Merger Agreement to be duly executed on the date and year first above written.


Optical Networks, Incorporated,
a California corporation

By: 
Hugh C. Martin
President, Chief Executive Officer and
Chairman of the Board of Directors

By: 
Michael A. Dillon
Vice President, General Counsel and
Secretary

ONI Systems Corp.,
a Delaware corporation

By: 
Hugh C. Martin
President, Chief Executive Officer and
Chairman of the Board of Directors

By: 
Michael A. Dillon
Vice President, General Counsel and
Secretary

[SIGNATURE PAGE TO AGREEMENT AND PLAN OF MERGER]

OPTICAL NETWORKS, INCORPORATED
(a California corporation)

OFFICERS' CERTIFICATE

Michael A. Dillon certifies that:

1. He is the Vice President, General Counsel and Secretary of Optical Networks, Incorporated, a California corporation (the "*Corporation*").
2. The Corporation has two classes of stock authorized, "Common Stock" and "Preferred Stock".
3. There were 34,943,875 shares of Common Stock and 79,194,900 shares of Preferred Stock (consisting of 24,795,510 shares of Series B Preferred Stock, 2,733,332 shares of Series C Preferred Stock, 4,969,148 shares of Series D Preferred Stock, 26,284,024 shares of Series E Preferred Stock, 8,249,468 shares of Series F Preferred Stock and 12,163,418 shares of Series G Preferred Stock) outstanding and entitled to vote on the Agreement and Plan of Merger in the form attached hereto (the "*Merger Agreement*").
4. The principal terms of the Merger Agreement were duly approved by the Board of Directors and by the vote of a number of shares of each class of stock which equaled or exceeded the vote required.
5. The percentage vote required to approve the Merger Agreement was the affirmative vote of at least a majority of the outstanding shares of Common Stock, voting as a separate class, and the affirmative vote of at least a majority of the outstanding shares of Preferred Stock, voting as a separate class.

I further declare under penalty of perjury under the laws of the States of California and Delaware that the matters set forth in this certificate are true and correct of our own knowledge.

Dated: April 25, 2000



Michael A. Dillon, Vice President, General
Counsel and Secretary

ONI SYSTEMS CORP.
(a Delaware corporation)

OFFICERS' CERTIFICATE

Michael A. Dillon certifies that:

1. He the Vice President, General Counsel and Secretary of ONI Systems Corp., a Delaware corporation (the "*Corporation*").
2. The Corporation has one class of stock authorized, "*Common Stock*".
3. There were 1,000 shares of Common Stock outstanding and entitled to vote on the Agreement and Plan of Merger in the form attached hereto (the "*Merger Agreement*").
4. The principal terms of the Merger Agreement were duly approved by the Board of Directors and by the vote of all of the outstanding shares of Common Stock.
5. The percentage vote required to approve the Merger Agreement was the majority of the outstanding Common Stock.

I further declare under penalty of perjury under the laws of the States of California and Delaware that the matters set forth in this certificate are true and correct of our own knowledge.

Dated: April 25, 2000



Michael A. Dillon, Vice President, General
Counsel and Secretary

EXHIBIT "A"

**FIRST AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION**

**FIRST AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
ONI SYSTEMS CORP.**

(Originally incorporated on February 24, 2000)

ONI Systems Corp., a Delaware corporation, hereby certifies that the First Amended and Restated Certificate of Incorporation of the corporation attached hereto as Exhibit "A", which is incorporated herein by this reference, has been duly adopted by the corporation's Board of Directors and stockholders in accordance with Sections 242 and 245 of the Delaware General Corporation Law, with the approval of the corporation's stockholders having been given by written consent without a meeting in accordance with Section 228 of the Delaware General Corporation Law.

IN WITNESS WHEREOF, said corporation has caused this First Amended and Restated Certificate of Incorporation to be signed by its by duly authorized officer.

Dated: April 25, 2000

ONI Systems Corp.



Michael A. Dillon,
Vice President, General Counsel and
Secretary

FIRST AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
ONI SYSTEMS CORP.

ARTICLE I

The name of the corporation is ONI Systems Corp.

ARTICLE II

The address of the registered office of the corporation in the State of Delaware is 15 East North Street, City of Dover, County of Kent. The name of its registered agent at that address is Incorporating Services, Ltd.

ARTICLE III

The purpose of the corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

ARTICLE IV

(A) Classes of Stock. The corporation is authorized to issue two classes of shares to be designated respectively Common Stock ("*Common Stock*") and Preferred Stock ("*Preferred Stock*"). The total number of shares of Common Stock the corporation shall have authority to issue is 185,000,000 shares, \$0.0001 par value per share, and the total number of shares of Preferred Stock the corporation shall have authority to issue is 80,309,408 shares, \$0.0001 par value per share.

(B) Series of Preferred Stock. The Preferred Stock authorized in Article IV, Section A above shall be divided into five series as follows: Twenty-Five Million Seventy-Three Thousand Four Hundred Thirty-Six (25,073,436) shares shall be designated as "*Series B Preferred Stock*," Two Million Seven Hundred Thirty-Three Thousand Three Hundred and Thirty-Two (2,733,332) shares shall be designated as "*Series C Preferred Stock*," Four Million Nine Hundred Sixty-Nine Thousand One Hundred Forty-Eight (4,969,148) shares shall be designated as "*Series D Preferred Stock*," Twenty-Six Million Two Hundred Eighty-Four Thousand Twenty-Four (26,284,024) shares shall be designated as "*Series E Preferred Stock*."

Eight Million Two Hundred Forty-Nine Thousand Four Hundred Sixty-Eight (8,249,468) shares shall be designated as "Series F Preferred Stock," and Thirteen Million (13,000,000) shares shall be designated as "Series G Preferred Stock." The rights, preferences, privileges and restrictions granted to and imposed upon the respective classes and series of the corporation's capital stock are set forth under Article IV, Section C.

(C) Rights, Preferences and Privileges of Capital Stock The rights, preferences, privileges and restrictions granted to or imposed on the respective classes of the shares of capital stock or the holders thereof are as follows:

i. Dividends. The holders of record of Common Stock (the "Common Holders") and the holders of record of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock (the "Preferred Holders") shall be entitled to receive, on a pari passu and an as-converted to Common Stock basis, dividends out of funds legally available therefor, when, as, and if declared by the Board of Directors, provided that the Preferred Holders shall be entitled to receive a non-cumulative, preferential dividend, the amount of which is equal to ten percent (10%) of their respective Preferred Liquidation Preference (as defined herein). Such preferential dividends shall be non-cumulative and no rights shall accrue to the Preferred Holders by reason of the fact that such dividends are not declared in any period.

ii. Liquidation Preferences.

(a) In the event of any Liquidation Event (as defined herein), the holders of record of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock will be entitled to receive, prior and in preference to any distribution of any of the assets or surplus funds of the Corporation to the holders of Common Stock, \$0.2355338295 per share of Series B Preferred Stock, \$0.75 per share of Series C Preferred Stock, \$0.881525 per share of Series D Preferred Stock, \$0.9125 per share of Series E Preferred Stock, \$1.8183 per share of Series F Preferred Stock and \$6.3175 per share of Series G Preferred Stock, respectively, plus any declared but unpaid dividends (the "Preferred Liquidation Preference"). If upon the occurrence of a Liquidation Event, the assets and funds to be distributed among the Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall be insufficient to permit the payment of the full Preferred Liquidation Preference, then the entire assets and funds of the Corporation legally available for distribution shall be distributed ratably among the holders of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock in proportion to the full preferential amount each such holder is entitled to receive pursuant to the Preferred Liquidation Preference.

(b) A "Liquidation Event" shall mean: (i) any liquidation, dissolution or winding up of the Corporation, whether voluntarily or involuntarily; (ii) the merger, consolidation or reorganization of the Corporation with or into any other corporation or corporations, in a transaction in which more than 50% of the voting power of the Corporation is

transferred by the existing shareholders of the Corporation; or (iii) a sale of all or substantially all of the assets of the Corporation, provided that this Section IV(C)(ii)(b) shall not apply to a merger effected exclusively for the purpose of changing the domicile of the Corporation.

(c) Solely in the event of a Liquidation Event which occurs prior to December 21, 2000 (a "*Participating Liquidation Event*"), then, after the full Preferred Liquidation Preference has been paid on all outstanding shares of Preferred Stock, any remaining funds and assets of the Corporation legally available for distribution to shareholders shall be distributed ratably among the holders of record of Common Stock, Series F Preferred Stock and Series G Preferred Stock pro rata according to the number of shares of Common Stock held by such holders, (where, for this purpose, holders of shares of Preferred Stock will be deemed to hold (in lieu of their Preferred Stock) the greatest whole number of shares of Common Stock then issuable upon conversion in full of such shares of Preferred Stock pursuant to Section IV(C)(v)) until such time (with respect to each series of Preferred Stock) as each holder of the shares of such Series F Preferred Stock and Series G Preferred Stock shall have received, in distributions made under this Section IV(C)(ii)(c), the Participation Amount (as defined below) for each then outstanding share of such series of Preferred Stock. The "*Participation Amount*" shall be equal to \$1.8183 per share with respect to Series F Preferred Stock and \$6.3175 per share with respect to Series G Preferred Stock.

(d) After the full Preferred Liquidation Preference has been paid on all outstanding shares of Preferred Stock pursuant to Section IV(C)(ii)(a) and, if applicable, the holders of Preferred Stock shall have received their full Participation Amount pursuant to Section III(C)(ii)(c), any remaining funds and assets of the Corporation legally available for distribution to shareholders shall be distributed ratably among the holders of Common Stock.

(e) Notwithstanding anything in this Article IV to the contrary, as authorized by Section 151 of the Delaware General Corporation Law, the Corporation may make distributions in connection with repurchases by the Corporation of shares of Common Stock issued to or held by employees, directors or consultants of or to the Corporation or any of its subsidiaries upon termination of their employment or services pursuant to agreements providing for the right of such repurchase at cost between the Corporation and such persons.

iii. Voting Rights. Except as otherwise required by law, the holder of each share of Preferred Stock shall be entitled to the number of votes equal to the number of shares of Common Stock into which such share of Preferred Stock could be converted on the record date for the determination of the shareholders entitled to vote on such matters, or if no such record date is established, at the date such vote is taken or written consent of shareholders is solicited and shall have voting rights and powers corresponding to the voting rights and powers of Common Stock. Except as otherwise required by law or as otherwise set forth herein, the holder of each share of Preferred Stock shall vote together with the holders of Common Stock as a single class on all matters and shall be entitled to notice of any shareholders meeting in accordance with the Bylaws of the Corporation. The holders of Common Stock shall be entitled to the number of votes equal to the number of shares held. Fractional shares shall not, however, be permitted any fractional voting rights resulting from the above formulas. Such fractional

shares shall be rounded to the nearest whole number (with one-half being rounded down). The number of members of the Board of Directors shall be six. Four directors shall be elected by the holders of record of the Series B Preferred Stock, Series C Preferred Stock and Series E Preferred Stock voting as a separate class, one director shall be elected by the holders of record of the Common Stock voting as a separate class, and one director shall be elected by the holders of record of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock, Series G Preferred Stock and Common Stock voting together as a single class. A director may be removed only by the holders of the class or classes of capital stock, as the case may be, who elected such director, and a successor to fill any position on the Board of Directors shall be filled exclusively by a vote of such class or classes of capital stock, as the case may be, that elected the director that previously filled that position.

iv. Certain Taxes. The Corporation shall pay any and all issuance and other taxes (excluding any federal or state income taxes) that may be payable in respect of any issuance or delivery of shares of Common Stock on conversion of the Preferred Stock. The Corporation shall not, however, be required to pay any tax that may be payable in respect of any transfer involved in the issuance and delivery of shares of Common Stock in a name other than that in which the shares of Preferred Stock to which such issuance relates were registered, and no such issuance or delivery shall be made unless and until the person requesting such issuance has paid to the Corporation the amount of any such tax, or it is established to the satisfaction of the Corporation that such tax has been paid.

v. Conversion. The Preferred Holders shall have conversion rights as follows (the "Conversion Rights"):

(a) Right to Convert; Automatic Conversion.

(i) Subject to Section IV(C)(v)(c), each share of Preferred Stock shall be convertible, at the option of the holder thereof, at any time after the date of issuance of such share, at the office of the Corporation or any transfer agent for such shares, into such number of fully paid and nonassessable shares of Common Stock determined as set forth below.

Each share of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall be convertible into such number of fully paid and nonassessable shares of Common Stock as is determined by dividing their respective Preferred Liquidation Preference by the applicable Conversion Price, determined as hereafter provided, in effect at the time of conversion. The initial "Conversion Price" for a series shall be the per share Preferred Liquidation Preference for such series; provided, however, that such Conversion Price shall be subject to other adjustments as set forth below.

(ii) Each share of Preferred Stock shall automatically be converted into shares of Common Stock at the applicable Conversion Price immediately upon the occurrence of the first of the following:

(A) Upon the closing of the sale of the Corporation's Common Stock in an underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended, covering the offer and sale of Common Stock for the account of the Corporation to the public in which the Corporation receives not less than \$20,000,000 (net of underwriters commissions and expenses) (a "Qualified IPO").

(B) The approval of such conversion by the written consent of the holders of 66-2/3% of the then-outstanding shares of Preferred Stock, voting together as a single class.

(b) Mechanics of Conversion. Before any holder of shares of Preferred Stock shall be entitled to convert the same into shares of Common Stock, such holder shall surrender the certificate or certificates therefor, duly endorsed, at the office of the Corporation or of any transfer agent for such shares, and shall give written notice by mail, postage prepaid, to the Corporation at its principal corporate office, of the election to convert the same and shall state therein the name or names in which the certificate or certificates for shares of Common Stock are to be issued. The Corporation shall, as soon as practicable thereafter, issue and deliver at such office to such holder of shares of Preferred Stock, or to the nominee or nominees of such holder, a certificate or certificates for the number of shares of Common Stock to which such holder shall be entitled as provided above. Such conversion shall be deemed to have been made immediately prior to the close of business on the date of such surrender of the certificate or certificates representing the shares of Preferred Stock to be converted, and the person or persons entitled to receive the shares of Common Stock issuable upon such conversion shall be treated for all purposes as the record holder or holders of such shares of Common Stock as of such date.

(c) Conversion Price Adjustments. The Conversion Price of each series of the Preferred Stock shall be subject to adjustment from time to time as follows:

(i) (A) If at any time after the date on which the Corporation first issues each series of Preferred Stock, the Corporation shall issue any Additional Stock (as defined herein) without consideration or for a consideration per share less than the Conversion Price for a given series of Preferred Stock in effect immediately prior to the issuance of such Additional Stock, then such Conversion Price in effect immediately prior to each such issuance shall (except as otherwise provided in this clause (i)) be adjusted to:

the Conversion Price determined by dividing (X) an amount equal to the sum of (a) the product derived by multiplying the Conversion Price in effect immediately prior to such issue times the number of shares of Common Stock (including shares of Common Stock deemed to have been issued upon conversion of the outstanding Preferred Stock or otherwise under Section IV(C)(v)(c)(i)(E)), outstanding immediately prior to such issue, plus (b) the consideration, if any, received by or deemed to have been received by the Corporation upon such issue, by (Y) an amount equal to the sum of (c) the number of shares of Common Stock (including shares of Common Stock deemed to have been issued upon conversion of the outstanding Preferred Stock or otherwise under Section IV(C)(v)(c)(i)(E)), outstanding immediately prior to such issue, plus (d) the number of shares of Common Stock issued or deemed to have

been issued in such issue.

(B) No adjustment of the Conversion Price for Preferred Stock shall be made in an amount less than one cent per share, provided that any adjustment that is not required to be made by reason of this sentence shall be carried forward and taken into account in any subsequent adjustment (at such time as an adjustment otherwise required by this Section IV(C)(v)(c), together with all prior carried forward adjustments, would cause an adjustment to the Conversion Price that is greater than or equal to one cent per share). Except to the limited extent provided for in Sections IV(C)(v)(c)(i)(E)(3), IV(C)(v)(c)(i)(E)(4) and IV(C)(v)(c)(iv), no adjustment of such Conversion Price shall have the effect of increasing the Conversion Price above the Conversion Price in effect immediately prior to such adjustment.

(C) In the case of the issuance of Common Stock for cash, the consideration shall be deemed to be the amount of cash paid therefor before deducting any reasonable discounts, commissions or other expenses allowed, paid or incurred by this Corporation for any underwriting or otherwise in connection with the issuance and sale thereof.

(D) In the case of the issuance of Common Stock for a consideration in whole or in part other than cash, the consideration other than cash shall be deemed to be the fair value thereof as determined in good faith by the Board of Directors.

(E) In the case of the issuance of options to purchase or rights to subscribe for Common Stock, securities by their terms convertible into or exchangeable for Common Stock or options to purchase or rights to subscribe for such convertible or exchangeable securities (where the shares of Common Stock issuable upon exercise of such options or rights or upon conversion or exchange of such securities are not excluded from the definition of Additional Stock), the following provisions shall apply:

(1) the aggregate maximum number of shares of Common Stock deliverable upon exercise of such options to purchase or rights to subscribe for Common Stock shall be deemed to have been issued at the time such options or rights were issued and for a consideration equal to the consideration (determined in the manner provided in Sections IV(C)(v)(c)(i)(C) and IV(C)(v)(c)(i)(D)), if any, received by the Corporation upon the issuance of such options or rights plus the minimum purchase price provided in such options or rights for the Common Stock covered thereby;

(2) the aggregate maximum number of shares of Common Stock deliverable upon conversion of or in exchange for any such convertible or exchangeable securities or upon the exercise of options to purchase or rights to subscribe for such convertible or exchangeable securities and subsequent conversion or exchange thereof shall be deemed to have been issued at the time such securities were issued or such options or rights were issued and for a consideration equal to the consideration, if any, received by the Corporation for any such securities and related options or rights (excluding any cash received on account of accrued interest or accrued dividends), plus the additional consideration, if any, to be received by the Corporation upon the conversion or exchange of such securities or the exercise of any related

options or rights (the consideration in each case to be determined in the manner provided in Sections IV(C)(v)(c)(i)(C) and IV(C)(v)(c)(i)(D));

(3) In the event of any change in the number of shares of Common Stock deliverable upon exercise of such options or rights or upon conversion of or in exchange for such convertible or exchangeable securities, including, but not limited to, a change resulting from the antidilution provisions thereof, the Conversion Price in effect at the time for Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall forthwith be readjusted to such Conversion Price as would have obtained had the adjustment that was made upon the issuance of such options, rights or securities not converted prior to such change or the options or rights related to such securities not converted prior to such change been made upon the basis of such change, but no further adjustment shall be made for the actual issuance of Common Stock upon the exercise of any such options or rights or the conversion or exchange of such securities;

(4) Upon the expiration of any such options or rights, the termination of any such rights to convert or exchange or the expiration of any options or rights related to such convertible or exchangeable securities, the Conversion Price for Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall forthwith be readjusted to such Conversion Price as would have obtained had the adjustment which was made upon the issuance of such options, rights or securities or options or rights related to such securities been made upon the basis of the issuance of only the number of shares of Common Stock actually issued upon the exercise of such options or rights, upon the conversion or exchange of such securities or upon the exercise of the options or rights related to such securities.

(ii) "*Effective Date*" means the date on which these Amended and Restated Articles of Incorporation are effective.

"*Additional Stock*" shall mean any shares of Common Stock issued (or deemed to have been issued pursuant to Section IV(C)(v)(c)(i)(E)) by the Corporation after the Effective Date other than:

(A) Common Stock issued pursuant to a transaction described in Section III(C)(v)(c)(iii);

(B) Common Stock issued or issuable to employees, officers, or directors of, or consultants to, the Corporation, pursuant to an arrangement approved by the Board of Directors;

(C) securities issued upon exercise of warrants issued to parties providing the Corporation with equipment leases, real property leases, loans, credit lines, or guarantees of indebtedness in connection with commercial credit arrangements, equipment financings or other similar transactions, and approved by the Board of Directors;

(D) securities issued pursuant to the acquisition of another

corporation by merger, purchase of all or substantially all of the assets, or other reorganization by the Corporation;

(E) Common Stock issued or issuable upon conversion of the shares of Preferred Stock; or

(F) securities issued to a customer, strategic corporate partner or potential strategic corporate partner and approved by the Board of Directors.

(iii) In the event the Corporation should at any time or from time to time subsequent to the effective date of this amendment fix a record date for the effectuation of a split or subdivision of the outstanding shares of Common Stock or the determination of holders of Common Stock entitled to receive a dividend or other distribution payable in additional shares of Common Stock or other securities or rights convertible into, or entitling the holder thereof to receive, directly or indirectly, additional shares of Common Stock (hereinafter referred to as "*Common Stock Equivalents*") without payment of any consideration by such holder for the additional shares of Common Stock or the Common Stock Equivalents (including the additional shares of Common Stock issuable upon conversion or exercise thereof), then, as of such record date (or the date of such dividend distribution, split or subdivision if no record date is fixed), the Conversion Price of the Preferred Stock shall be appropriately decreased so that the number of shares of Common Stock issuable on conversion of each such share shall be increased in proportion to such increase of outstanding shares determined by taking Section III(C)(v)(c)(i)(E) into account.

(iv) If the number of shares of Common Stock outstanding at any time after the Effective Date is decreased by a combination of the outstanding shares of Common Stock, then, as of the record date of such combination, the Conversion Price of the Preferred Stock shall be appropriately increased so that the number of shares of Common Stock issuable on conversion of each such share shall be decreased in proportion to such decrease in outstanding shares.

(d) Other Distributions. In the event the Corporation shall declare a distribution payable in securities of other persons, evidences of indebtedness issued by the Corporation or other persons, assets (excluding cash dividends) or options or rights not referred to in Section IV(C)(v)(c)(iii), then, in each such case for the purpose of this Section (d), the holders of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall be entitled to a proportionate share of any such distribution as though they were the holders of the number of shares of Common Stock of the Corporation into which their shares of Preferred Stock are convertible as of the record date fixed for the determination of the holders of Common Stock of the Corporation entitled to receive such distribution.

(e) Recapitalizations. If at any time or from time to time there shall be a recapitalization of the Common Stock (other than a subdivision, combination or merger or sale of assets transaction provided for elsewhere in this Section), provision shall be made (in form and substance satisfactory to the holders of a majority of the Series B Preferred Stock, Series C

Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock then outstanding) so that the holders of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock shall thereafter be entitled to receive, upon conversion of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock such shares or other securities or property of the Corporation or otherwise, to which a holder of Common Stock deliverable upon conversion would have been entitled on such recapitalization. In any such case, appropriate adjustment shall be made in the application of the provisions of this Section with respect to the rights of the holders of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock after the recapitalization to the end that the provisions of this Section (including adjustment of the Conversion Prices then in effect and the number of shares purchasable upon conversion of shares of Preferred Stock) shall be applicable after that event as nearly equivalent as may be practicable.

(f) No Fractional Shares and Certificate as to Adjustments.

(i) No fractional shares shall be issued upon conversion of shares of Preferred Stock. In lieu of fractional shares, the number of shares of Common Stock to be issued to a Preferred Holder upon conversion of all of the shares being converted of Preferred Stock held by such holder shall be rounded to the nearest whole number.

(ii) Upon the occurrence of each adjustment of the Conversion Price of any series of Preferred Stock, the Corporation, at its expense, shall promptly compute such adjustment in accordance with the terms hereof and prepare and furnish to each Preferred Holder with respect to which the Conversion Price is being adjusted a certificate setting forth such adjustment and showing in detail the facts upon which such adjustment is based.

(g) Notices of Record Date. In the event of any taking by the Corporation of a record of its shareholders for the purpose of determining shareholders who are entitled to receive payment of any dividend (other than a cash dividend) or other distribution, any right to subscribe for, purchase or otherwise acquire any shares of any class or any other securities or property, or to receive any other right, the Corporation shall mail to each holder of shares of Preferred Stock, at least 20 days prior to the date specified therein, a notice specifying the date on which any such record is to be taken for the purpose of such dividend, distribution or right, and the amount and character of such dividend, distribution, or right.

(h) Reservation of Shares Issuable Upon Conversion. The Corporation shall at all times reserve and keep available out of its authorized but unissued shares of Common Stock, solely for the purpose of effecting the conversion of the shares of Preferred Stock, such number of its shares of Common Stock as shall from time to time be sufficient to effect the conversion of all outstanding shares of Preferred Stock; and if at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of Preferred Stock, the Corporation will take such corporate action as may, in the opinion of its counsel, be necessary to increase its authorized but unissued shares

of Common Stock to such number of shares as shall be sufficient for such purposes.

(i) Notices. Any notice required by the provisions of this Section to be given to Preferred Holders shall be deemed to be delivered when deposited in the United States mail, postage prepaid, registered or certified, and addressed to each holder of record at his address appearing on the stock transfer books of the Corporation.

vi. Protective Provisions. Until (i) the consummation of a Qualified IPO, or (ii) at least 35% of each of the Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock (appropriately adjusted for stock splits, stock dividends, recapitalizations and similar events subsequent to the effective date of this amendment) shall have been converted into Common Stock,

(a) the Corporation shall not without first obtaining the approval (by vote or written consent, as provided by law) of the holders of at least a majority of the then outstanding shares of Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock, voting together as a class:

- (1) amend or repeal any provision of or add any provision to the Corporation's Articles of Incorporation;
- (2) effect a transaction described in Section IV(C)(ii)(b) above;
- (3) declare any dividends on or make any distribution on account of the Common Stock;
- (4) redeem, repurchase or otherwise acquire (or pay into or set aside for a sinking fund for such purposes) any share or shares of Preferred Stock or Common Stock, except for repurchases of Common Stock issued to and held by employees, directors, consultants or other persons performing services for the Corporation or any of its subsidiaries pursuant to agreements providing for the right of such repurchase at cost between the Corporation and such persons upon the occurrence of certain events, such as termination of their employment or services;
- (5) amend any stock option or equity incentive plan to modify the number of shares of the Corporation's stock issuable thereunder; or
- (6) sell or grant any exclusive license to the Corporation's intellectual property without the unanimous approval of the Board of Directors; and

(b) the Corporation shall not without first obtaining the approval (by vote or written consent, as provided by law) of the holders of at least a majority of the then outstanding shares of Series B Preferred Stock, voting separately as a class, the holders of at least a majority

of the then outstanding shares of Series C Preferred Stock, voting separately as a class, the holders of at least a majority of the then outstanding shares of Series D Preferred Stock, voting separately as a class, the holders of at least a majority of the then outstanding shares of Series E Preferred Stock, voting separately as a class, the holders of at least a majority of the then outstanding shares of Series F Preferred Stock, voting separately as a class, and the holders of at least a majority of the then outstanding shares of Series G Preferred Stock, voting separately as a class, authorize or issue, or obligate itself to issue, any other equity security which is, or is convertible into or exercisable for any equity security senior to the Series B Preferred Stock, Series C Preferred Stock, Series D Preferred Stock, Series E Preferred Stock, Series F Preferred Stock and Series G Preferred Stock, respectively with respect to voting, dividends, conversion or upon liquidation.

D. For so long as the Corporation is not a reporting company under the Securities Exchange Act of 1934, as amended (the "*Exchange Act*"), neither the Common Stock or Preferred Stock of the Corporation (or any shares of Common Stock or Preferred Stock issued as a result of any stock splits or the like) may be transferred except for transfers:

(i) which would be exempt from the registration requirements of Section 5 of the Securities Act of 1933, as amended (the "*Securities Act*"); provided that any shares of such stock in the hands of any such transferee remain subject to the same restrictions on transfer as they were when held by the transferor;

(ii) pursuant to an effective registration statement under the Securities Act simultaneously with a registration of such stock of the Corporation under Section 12 of the Exchange Act;

(iii) to the Corporation;

(iv) to existing stockholders of the Corporation; provided that any shares of such stock in the hands of any such transferee remain subject to the same restrictions on transfer as they were when held by the transferor;

(v) by gift, bequest or operation of the laws of descent or distribution, provided that any shares of such stock in the hands of the transferee remain subject to the same restrictions on transfer as they were when held by the transferor;

(vi) to an entity unaffiliated with the Corporation pursuant to the merger, consolidation, stock for stock exchange, tender offer or similar transaction involving the Corporation;

(vii) to a trust for employees of the Corporation established under a qualified employee benefit plan

(viii) by a trust to such trust's beneficiaries; provided that any shares of such stock in the hands of any such transferee remain subject to the same restrictions on transfer as they were

when held by the transferor, or

(ix) to an "affiliate" (as defined in the Securities Act) of such stockholder, provided that such affiliate is an "accredited investor" (as defined in Regulation D promulgated under the Securities Act).

ARTICLE V

The Board of Directors of the corporation shall have the power to adopt, amend or repeal the Bylaws of the corporation.

ARTICLE VI

For the management of the business and for the conduct of the affairs of the corporation, and in further definition, limitation and regulation of the powers of the corporation, of its directors and of its stockholders or any class thereof, as the case may be, it is further provided that:

(A) The conduct of the affairs of the corporation shall be managed under the direction of the Board of Directors. The number of directors shall be fixed from time to time exclusively by resolution of the Board of Directors.

(B) Notwithstanding the foregoing provision of this Article VI, each director shall hold office until such director's successor is elected and qualified, or until such director's earlier death, resignation or removal. No decrease in the authorized number of directors constituting the Board of Directors shall shorten the term of any incumbent director.

(C) Following the closing of the corporation's initial public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended, covering the offer and sale of Common Stock to the public (the "*Initial Public Offering*"), no action shall be taken by the stockholders of the corporation except at an annual or special meeting of stockholders called in accordance with the Bylaws of the corporation, and no action shall be taken by the stockholders by written consent.

(D) Advance notice of stockholder nominations for the election of directors of the corporation and of business to be brought by stockholders before any meeting of stockholders of the corporation shall be given in the manner provided in the Bylaws of the corporation. Business transacted at special meetings of stockholders shall be confined to the purpose or purposes stated in the notice of meeting.

(E) Subject to Section 6.5 of the Bylaws of the corporation, following the closing of the Initial Public Offering, stockholders of the corporation holding at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors shall have the power to adopt, amend or repeal Bylaws of the corporation.

Following the closing of the Initial Public Offering, the affirmative vote of the holders of at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors, voting together as a single class, shall be required to alter, change, amend, repeal or adopt any provision inconsistent with this Article VI.

ARTICLE VII

To the fullest extent permitted by law, no director of the corporation shall be personally liable for monetary damages for breach of fiduciary duty as a director. Without limiting the effect of the preceding sentence, if the Delaware General Corporation Law is hereafter amended to authorize the further elimination or limitation of the liability of a director, then the liability of a director of the corporation shall be eliminated or limited to the fullest extent permitted by the Delaware General Corporation Law, as so amended.

Neither any amendment nor repeal of this Article VII, nor the adoption of any provision of this Certificate of Incorporation inconsistent with this Article VII, shall eliminate, reduce or otherwise adversely affect any limitation on the personal liability of a director of the corporation existing at the time of such amendment, repeal or adoption of such an inconsistent provision.

Following the closing of the Initial Public Offering, the affirmative vote of the holders of at least sixty-six and two-thirds percent (66-2/3%) of the corporation's outstanding voting stock then entitled to vote at an election of directors, voting together as a single class, shall be required to alter, change, amend, repeal or adopt any provision inconsistent with this Article VII.

THIS INTELLECTUAL PROPERTY ASSIGNMENT AND LICENSE AGREEMENT (the "Agreement") is made by and between Optivision, Inc., a California corporation ("Optivision" or the "Assignor") and Optical Networks, Incorporated, a California corporation ("ONI" or the "Assignee"). effective as of the 12th day of January, 1998.

A. WHEREAS, under the terms of that certain License Agreement, effective as of October 29, 1997, a copy of which is attached hereto as Attachment A (the "License Agreement"), Optivision granted ONI a worldwide, royalty-bearing exclusive license, with right of sublicense, under certain of its intellectual property rights for the commercialization of certain photonics technology and related intellectual property in connection with the spin-off by Optivision of ONI (the "Initially Licensed Optivision IP");

B. WHEREAS, various investors, including investors affiliated with Kleiner Perkins Caufield & Byers and Mohr, Davidow Ventures (such affiliated investors, collectively, the "Purchasers"), have entered into the Series B and C Preferred Stock Purchase Agreement, dated as of December 19, 1997 (the "Preferred Stock Purchase Agreement");

C. WHEREAS, in satisfaction of a condition of the Purchasers to the B Round Closing (as that term is defined in the Preferred Stock Purchase Agreement), and in order to attract and retain a chief executive officer for ONI, Optivision and ONI are this date entering into this Agreement in order to provide ONI (i) from the date hereof until the C Round Closing Date (as that term is defined in the Preferred Stock Purchase Agreement) with an exclusive license under all of the intellectual property of Optivision described on Attachment B hereto (the "Optivision Photonics IP") and any and all improvements, modifications, enhancements and other inventions or technology relating to the Optivision Photonics IP made by Optivision, including without limitation any United States and foreign patents and patent applications (including any substitutions, divisions, continuations, continuations-in-part, and patents of addition in respect thereof which are filed by Optivision or which claim inventions which are conceived and reduced to practice during the term of the License Agreement (the "Optivision Photonics IP Improvements"); and (ii) as of and from the C Round Closing Date, a transfer and assignment of its entire right, title and interest in all of the Optivision Photonics IP, the Initially Licensed Optivision IP, and the Optivision Photonics IP Improvements;

NOW, THEREFORE, in consideration of good and valuable consideration acknowledged by Assignor to have been received in full from Assignee:

1. License. (a) Subject to the terms and conditions of this agreement, from the date hereof until the C Round Closing Date, Optivision hereby grants to ONI a worldwide, exclusive license, with the right of sublicense, under the Optivision Photonics IP and the Optivision Photonics IP Improvements (for the purposes of this Section 1 only, such defined terms shall be deemed to be "Licensed Subject Matter" as that term is used under the License Agreement) (i) to make, have made, sell, and use any services and/or goods, and to practice any method, process or procedure, resulting in, arising out of, or related to the commercialization of the Licensed Subject Matter, and (ii) to otherwise exploit the Licensed Subject Matter for any and all Commercial Purposes (collectively with the grant provided for in clause (i), the "Licensed Applications") and to have any of the Licensed Applications performed on its behalf by a third party. Nothing in this License Agreement shall be construed to grant ONI any right

Optivision Photonics IP Improvements out any infringement of the rights of the Series B and C Preferred Shares valid, enforceable and subsisting. Optivision Photonics IP Improvements or patent rights of any third party. and is not otherwise aware of, any claim with regard to its use of the Optivision IP Improvements hereby.

EXCEPT AS STATED ABOVE
EXPRESS, IMPLIED, STATUTORY

Liability. IN NO EVENT WILL
DIRECT, INDIRECT, INCIDENTAL (OR
) THIS AGREEMENT.

and Confidentiality.

Disclosure. In connection with this Assignment, Assignee agrees to disclose to Assignor, subject to the terms of the License Agreement, all information and Optivision Photonics IP Improvements to the extent possessed by Assignor

Confidential Information. Except as expressly provided herein, Assignor shall not publish or otherwise disclose the Confidential Information contemplated by this Agreement. Sprint Communications Company shall not be unreasonably withheld from disclosing the Confidential Information to Assignor as to the information so disclosed. Assignor shall provide Assignee with competent proof that such information

was generally available to the public prior to its disclosure to the Assignor;

became generally available to the public in other than through any act or omission of Assignor;

was subsequently lawfully disclosed

under the Licensed Subject Matter for purposes other than the Licensed Subject Matter specifically retained by Optivision.

(b) Sections 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, Articles 3 (except that Article 3 shall not be perpetual or irrevocable), 4 (except that none of the Licensed Subject Matter shall be exclusive), 5, 6, 7, 8, 9, 10 (to the limited extent that such Article imposes obligations upon Optivision), and Sections 11.1, 11.2, 11.4, 11.5, 11.6, 11.7, and 11.8 (to the extent that they agree) of the License Agreement are hereby incorporated by reference and shall form part of this license grant.

(c) The parties acknowledge and agree that, upon the expiration of the term hereof, the license grant contained in this Section 1(a) and the Section 1(b) shall terminate automatically in their entirety, such that the License shall survive or be of any force or effect, and that the parties owe no obligation to each other under 1(a) and 1(b).

2. Assignment. Subject to the terms and conditions of this Agreement, Assignor's sale of the Series C Preferred Stock of Assignee pursuant to the Preference Agreement (the "Effective Date"), Assignor hereby irrevocably sells, assigns, transfers and conveys to Assignee hereby accepts the sale, assignment, transfer and conveyance of all interest in and to the Optivision Photonics IP and Optivision Photonics IP Improvements, not limited to, the patent, and patent applications therein described, and all information, data, and information possessed or licensed by Assignor as defined in the License Agreement.

3. Grant-Back of License to Assignor. Assignee hereby grants to Assignor an irrevocable, non-exclusive, non-transferable, royalty free license to make, use, sell, license, assign, transfer, and otherwise exploit services and/or goods, and to practice any method, process or procedure for the manufacture of Optivision Photonics IP and Optivision Photonics IP Improvements that are necessary for the sole purpose of performing Assignor's obligations under the outstanding contracts with the U.S. Government listed on Attachment C and Assignor and Sprint Communications Company LP, provided that Assignor shall not have the right to sublicense, transfer or otherwise exploit Assignee's prior written consent. Except as may be necessary to perform the obligations under the contracts, Optivision shall not make, use or sell any goods or services using the Optivision Photonics IP or Optivision Photonics IP Improvements for any purpose other than the party any right thereunder for any purpose.

3. Warranties of Title. Assignor hereby represents and warrants that

(a) Assignor has the right to enter into and perform the License Agreement and to make this Assignment, and such Assignment is not in violation of the License Agreement. To the best of Assignor's knowledge, the execution, delivery and performance of the License Agreement does not conflict with, violate, or breach any agreement of Assignor and Assignee of and holds all right, title and interest in and to the Optivision Photonics IP Improvements, and has the right to use, sell, license, assign, transfer

(c) Permitted Use and Disclosures. Assignee is hereby deemed the "owner" of the Optivision Photonics IP and Optivision Photonics IP Improvements effective upon this Assignment and may use or disclose information disclosed to it by the Assignor without restriction.

6. Further Assurances. Assignor will cooperate with Assignee to enable Assignee to enjoy to the fullest extent the right, title and interest herein conveyed. Such cooperation by Assignor shall include prompt production of pertinent facts and documents, giving of testimony, execution of petitions, oaths, specifications, declarations or other papers, and other assistance all to the extent reasonably necessary for the benefit of Assignee (a) for perfecting in Assignee the right, title and interest herein conveyed; (b) for prosecuting patent applications; (c) for filing and prosecuting substitute, divisional, continuing or additional applications covering any Optivision Photonics IP or Optivision Photonics IP Improvements; (d) for interference or other priority proceedings involving any Optivision Photonics IP or Optivision Photonics IP Improvements; and (e) for legal proceedings involving Optivision Photonics IP or Optivision Photonics IP Improvements and any applications therefor and any patents granted thereon, including without limitation reissues and reexaminations, opposition proceedings, cancellation proceedings, priority contests, public use proceedings, infringement actions and court actions; provided, however, that the expense incurred by Assignor in providing such cooperation shall be paid by Assignee.

7. Miscellaneous.

(a) Governing Law. This agreement and any dispute arising from the performance or breach hereof shall be governed by the laws of the United States of America and the State of California, without regard to that state's laws concerning conflicts or choice of laws.

(b) Waiver. Neither party may waive or release any of its rights or interests in this agreement except in writing. The failure of either party to assert a right hereunder or to insist upon compliance with any term or condition of this agreement shall not constitute a waiver of that right or excuse a similar subsequent failure to perform any such term or condition.

(c) Assignment. This agreement shall not be assignable by either party to any third party hereto without the written consent of the other party hereto and any such attempt to assign shall be void, provided, however, that Assignee shall have the right to assign this agreement to a successor to all or substantially all of its assets or business, whether by sale, merger or otherwise. Any permitted assignee or transferee shall agree in writing to comply with all the terms and restrictions contained in this agreement.

(d) Independent Contractors. The relationship of the parties hereto is that of independent contractors. The parties hereto are not agents, partners or joint venturers of the other for any purpose as a result of this agreement or the transactions contemplated thereby.

(e) Notices. All notices, requests and other communications hereunder shall be given in writing by certified or registered mail to the addresses set forth below and shall be deemed received on the actual date of receipt:

If to Assignor:

Optivision, Inc.
3450 Hillside Avenue
Palo Alto, CA 94304

Attention: _____

If to Assignee:

Optical Networks, Incorporated
3450 Hillside Avenue
Palo Alto, CA 94304

Attention: _____

(f) Complete Agreement. Except as otherwise provided in Section 1 hereof, this agreement constitutes the entire agreement, both written and oral, between the parties with respect to the subject matter hereof, and all prior agreements respecting the subject matter hereof, either written or oral, expressed or implied, are merged and canceled, and are null and void and of no effect. No amendment or change hereof or addition hereto shall be effective or binding on either of the parties hereto unless reduced to writing and executed by the respective duly authorized representatives of the parties. The parties acknowledge and agree that as of the C Round Closing Date the License Agreement dated effective as of October 29, 1997 between the parties is hereby terminated in its entirety, such that no section under such agreement shall survive, and that the parties owe no obligations to each other under the License Agreement.

(g) Successors and Assigns. The provisions hereof shall inure to the benefit of, and be binding upon, the successors, assigns, heirs, executors, and administrators of the parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their authorized representatives as of the date first above written.

OPTICAL NETWORKS, INCORPORATED

By: [Signature]

Name: _____

Title: _____

OPTIVISION, INC.

By: [Signature]

Name: _____

Title: _____

ATTACHMENT A

License Agreement

LICENSE AGREEMENT

This LICENSE AGREEMENT (the "License Agreement"), effective as of October 29, 1997 (the "Effective Date"), is made by and between Optivision, Inc., a California corporation ("Optivision"), and Optical Networks, Incorporated, a California corporation ("ONI").

RECITALS

A. WHEREAS, Optivision and ONI are parties to that certain Contribution, Services and Share Purchase Agreement dated as of October 29, 1997, under which they agreed to enter into this License Agreement;

B. WHEREAS, Optivision is the owner of certain patent and other rights and information relating to the simultaneous operation of single and multiple wavelength lightwave communication networks, and desires to grant ONI an exclusive license under such rights to make use of such technology for commercial applications, and ONI desires to acquire such a license, on the terms and conditions set forth herein.

NOW THEREFORE, it is agreed by and between the parties as follows:

1. DEFINITIONS

1.1 "Proprietary Information" shall mean any and all information possessed or licensed by Optivision having to do with any form of optical devices, switches, connectors, systems, networks and the protocols and applications used therein, of any kind, in any form and media whatsoever, that is reasonably necessary for ONI to exercise its rights under Section 2.1 of this Agreement, including, without limitation, (a) inventions, whether or not patentable, whether or not reduced to practice, and whether or not yet made the subject of a pending patent application or applications; (b) ideas and conceptions of potentially patentable subject matter, including, without limitation, any patent disclosures, whether or not reduced to practice, and whether or not yet made the subject of a pending patent application or applications; (c) copyrights (registered or otherwise) and registrations and applications for registration thereof, and all rights therein provided by international treaties or conventions; (d) computer software, including, without limitation, source code, operating systems and specifications, data, data bases, files and related documentation; (e) trade secrets and confidential, technical and business information (including ideas, formulas, compositions, inventions, and conceptions of inventions whether patentable or unpatentable, and whether or not reduced to practice); (f) whether or not confidential, technology (including know-how and show-how), manufacturing and production processes and techniques, research and development information, drawings, specifications, designs, plans, proposals, technical data, copyrightable works, financial, marketing and business data, pricing and cost information, business and marketing plans and customer and supplier lists and information; (g) copies and tangible embodiments of all the foregoing, in whatever form or medium; and (h) all rights to obtain and rights to apply for patents, and to register trademarks and copyrights.

1.2 "Patent" shall mean (i) the patent and patent applications set forth on Exhibit A hereto, and (ii) any substitutions, divisions, continuations, continuations-in-part applications, and patents of addition of (i) above.

1.3 "Licensed Subject Matter" shall mean (i) the Patent, (ii) the Proprietary Information, and, if so developed by ONI, (iii) the ONI Improvements. Upon prompt written notice from the parties as necessary to effectuate the following right, ONI shall also have the right to include in the Licensed Subject Matter any United States and foreign patents and patent applications (including any substitutions, divisions, continuations, continuations-in-part, and patents of addition in respect thereof) which are filed by Optivision or which claim inventions which are conceived and reduced to practice during the term of this License Agreement.

1.4 "Commercial Purposes" shall mean all purposes other than those purposes for which use rights have been granted to governmental entities (other than those governmental agencies which have as their principal function the provision of civilian communications functions) and includes, without limitation, the practice, production, manufacture, right to have manufactured, sale and use of goods and/or services using the Licensed Subject Matter.

1.5 "Licensed Applications" shall have the meaning set forth in Section 2.1.

1.6 "Gross Revenue" shall mean any and all amounts received by ONI resulting from, arising out of, or related to the practice, production, manufacture, sale or use of products and/or services using the Licensed Subject Matter, computed in accordance with generally accepted accounting principles.

1.7 "Confidential Information" shall mean (i) any Proprietary Information, (ii) any information or material in tangible form disclosed hereunder that is marked as "Confidential" at the time it is delivered to the receiving party, and (iii) information disclosed orally hereunder which is identified as "Confidential" when disclosed and such disclosure of "Confidential" information is confirmed in writing within thirty (30) days by the disclosing party.

2. LICENSE GRANT

2.1 License. Subject to Sections 2.3 and 2.4 below, Optivision hereby grants to ONI a worldwide, exclusive license, with the right of sublicense, under the Licensed Subject Matter (i) to make, have made, sell, and use any services and/or goods, and to practice any method, process or procedure, resulting in, arising out of, or related to the commercialization of the Licensed Subject Matter, and (ii) to otherwise exploit the Licensed Subject Matter for any and all Commercial Purposes (collectively with the grant provided for in clause (i), the "Licensed Applications") and to have any of the Licensed Applications performed on its behalf by a third party. Nothing in this License Agreement shall be construed to grant ONI any right under the Licensed Subject Matter for purposes other than the Licensed Applications, which rights are specifically retained by Optivision.

2.2 Non-Competition. During the term hereof, Optivision agrees (i) not to make, use or sell any goods or services using any aspect of the Licensed Subject Matter for any Commercial

Purpose, and (ii) not to grant any third party any right under the Licensed Subject Matter for any Commercial Purpose.

2.3 Retained Rights. Optivision hereby retains an exclusive, transferable right to the Licensed Subject Matter for its own technology development and purposes other than a Commercial Purpose.

2.4 Governmental Rights. The parties understand that the Licensed Subject Matter may have been developed under a funding agreement with the Government of the United States and, if so, that the Government of the United States may have certain rights relative thereto. Optivision represents and warrants that it (i) has complied and agrees to continue to comply during the term of this License Agreement with all laws and regulations applicable to such a Government funding agreement and (ii) has done and will continue to do all acts necessary or convenient for the protection of Optivision's rights to retain ownership of all inventions within the Licensed Subject Matter, including disclosing subject inventions to the Government and electing to retain title in subject inventions.

2.5 Rights of Third Party. ONI understands that the Licensed Subject Matter may be subject to a research and development agreement entered into by Optivision and Sprint Communications Company LP ("Sprint"). ONI acknowledges that this License Agreement is subject, in all respects, to the rights of Sprint under such agreement and agrees to hold any information it receives pertaining to the existence of such agreement, as well as any Proprietary Information (as that term is defined in such agreement) received from Sprint, either directly or indirectly, confidential.

2.6 Government Regulations. It is understood that Optivision is subject to United States laws and regulations controlling the export of technical data, computer software, laboratory prototypes and other commodities (including the Arms Export Control Act, as amended, and the Export Administration Act of 1979), and that its obligations hereunder are contingent on compliance with applicable United States export laws and regulations. The transfer of certain technical data and commodities may require a license from the cognizant agency of the United States Government and/or written assurances by ONI that ONI shall not export data or commodities to certain foreign countries without prior approval of such agency.

2.7 Non-Use of Name. ONI shall not use the names Optivision, Optivision, Inc. or the names of any Optivision employee, or any adaptation thereof, in any advertising, promotional or sales literature for the Licensed Applications without the prior written consent of Optivision, which consent shall not be unreasonably withheld, except that ONI may state that it is licensed by Optivision under one or more patents or applications comprising the Licensed Subject Matter.

3. GRANT BACK

The parties hereby recognize that, during the term of this License Agreement, ONI may develop improvements, modifications, enhancements and other inventions or technology related to the Licensed Subject Matter (the "ONI Improvements"). ONI hereby grants to Optivision a non-exclusive, perpetual, worldwide, irrevocable, royalty-free license under the Licensed Subject Matter to the ONI Improvements for use by Optivision for purposes other than a Commercial Purpose, provided, that Optivision shall not have the right to sublicense, transfer or assign such license without ONI's prior written consent. Such license includes the right to make, use, sell and sublicense ONI Improvements for purposes other than a Commercial Purpose. ONI agrees to disclose to Optivision any ONI Improvements promptly upon development thereof.

4. ROYALTIES

4.1 Royalties to Optivision. In the event that, during the term of this License Agreement, ONI may earn Gross Revenue in a calendar quarter in excess of \$500,000, ONI shall prepare reports setting forth its Gross Revenue for that and each successive calendar quarter during the term of this License Agreement and shall deliver such reports to Optivision within thirty (30) days after the end of each calendar quarter. In addition, concurrent with the delivery of the report, ONI shall pay to Optivision an amount equal to one and one-half percent (1.5%) of the Gross Revenue for the applicable calendar quarter, as set forth in the report. Data relating to royalties payable to Optivision under this Section 4.1, including the Gross Revenue for any period shall be considered Confidential Information and shall not be disclosed by Optivision or ONI except as otherwise provided in Section 9.1 and 9.2 hereof. In the event that any of the Licensed Subject Matter commercialized by ONI shall become non-exclusive, or in ONI's reasonable discretion, it becomes necessary to pay a third party royalties or other amounts in order to practice or otherwise exploit the Licensed Applications, ONI may deduct from any royalties payable hereunder the amount actually paid to such third party.

4.2 Audit. ONI shall maintain complete and accurate books and records with respect to its Gross Revenue for a period of not less than four (4) years from the end of the fiscal quarter to which they pertain. Optivision shall be entitled to retain an independent auditor, which shall be reasonably acceptable to ONI, to audit the books and records of ONI pertaining to the payment of royalties to Optivision hereunder, for the sole purpose of confirming the accuracy of the royalty payments, on no more than two occasions per fiscal year of ONI. Any such audit shall be performed at Optivision's expense during normal business hours. If, however, such audit reveals an underpayment of five percent (5%) or more of the amount that should have been paid to Optivision for the period audited, then ONI shall bear the expense of the audit. In the event of any underpayment of royalties, ONI shall promptly remit to Optivision all amounts due plus interest thereon at 10% per annum, prorated for the actual period of arrearage.

5. COMMERCIALIZATION

ONI agrees to use commercially reasonable efforts to use the license granted herein to generate Gross Revenue.

6. OWNERSHIP

6.1 Optivision Ownership. Subject to the license contained in Section 2 above, ownership of the Licensed Subject Matter, and any other technology, documentation or other materials delivered to ONI hereunder, and all intellectual property rights therein, including without limitation, copyrights, patents, trade secrets, mask works and other proprietary rights, shall remain exclusively with Optivision and no rights granted hereunder shall be construed to confer any additional rights upon ONI by implication, estoppel or otherwise.

6.2 ONI Ownership. Subject to the grant-back license contained in Section 3 above, and to Optivision's ownership of any technology it produces as provided in Section 6.1 above, ownership of ONI Improvements and any other technology, documentation or other materials delivered to Optivision hereunder, and all intellectual property rights therein, including without limitation, copyrights, patents, trade secrets, mask works and other proprietary rights, shall remain exclusively with ONI and no rights granted hereunder shall be construed to confer any additional rights upon Optivision by implication, estoppel or otherwise.

7. WARRANTIES OF OPTIVISION

7.1 To the best of Optivision's knowledge, the Licensed Subject Matter does not and will not infringe the copyrights or trade secret rights or patent rights of any third party.

7.2 The licenses granted to ONI hereunder are exclusive, valid and enforceable against Optivision. Optivision has valid title to the Licensed Subject Matter or holds or will hold licenses therefor for the Initial Period and any Renewal Period (as such terms are defined below), free of any claims or encumbrances.

7.3 EXCEPT AS STATED ABOVE IN SECTIONS 7.1 AND 7.2, OPTIVISION EXPRESSLY DISCLAIMS ANY WARRANTIES OR CONDITIONS, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE. EXCEPT AS STATED ABOVE IN SECTION 7.1, OPTIVISION MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OR CONDITIONS OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND, VALIDITY OF LICENSED TECHNOLOGY, PATENTED OR UNPATENTED. EXCEPT AS STATED ABOVE IN SECTION 7.1, OPTIVISION ASSUMES NO RESPONSIBILITIES OR LIABILITIES WHATSOEVER WITH RESPECT TO THE USE OF THE LICENSED SUBJECT MATTER.

8. LIMITATION OF LIABILITY

OPTIVISION'S LIABILITY ARISING OUT OF OR RELATED TO THIS LICENSE AGREEMENT SHALL NOT EXCEED THE AMOUNTS RECEIVED BY OPTIVISION HEREUNDER. IN NO EVENT WILL OPTIVISION BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT, INCIDENTAL OR PUNITIVE DAMAGES ARISING OUT OF OR RELATED TO THIS LICENSE AGREEMENT, HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY (INCLUDING NEGLIGENCE).

9. CONFIDENTIALITY

9.1 Confidential Information. Except as expressly provided herein, the parties agree that, for the term of this License Agreement and thereafter the receiving party shall keep completely confidential and shall not publish or otherwise disclose and shall not use for any purpose except for the purposes contemplated by this License Agreement any Confidential Information furnished to it by the disclosing party hereto, except that to the extent that it can be established by the receiving party by competent proof that such Confidential Information:

- (a) was already known to the receiving party, other than under an obligation of confidentiality, at the time of disclosure;
- (b) was generally available to the public or otherwise part of the public domain at the time of its disclosure to the receiving party;
- (c) became generally available to the public or otherwise part of the public domain after its disclosure and other than through any act or omission of the receiving party in breach of this License Agreement;
- (d) was independently developed by the receiving party as demonstrated by documented evidence prepared contemporaneously with such independent development; or
- (e) was subsequently lawfully disclosed to the receiving party by a person other than a party.

9.2 Permitted Use and Disclosures. Each party hereto may use or disclose information disclosed to it by the other party to the extent such use or disclosure is reasonably necessary in filing or prosecuting patent applications, prosecuting or defending litigation, complying with applicable governmental regulations or otherwise submitting information to tax or other governmental authorities, or otherwise exercising its rights hereunder; provided that if a party is required to make any such disclosure of another party's Confidential Information, other than pursuant to a confidentiality agreement, it will give reasonable advance notice to the latter party of such disclosure and, except to the extent inappropriate in the case of patent applications, will use its best efforts to secure confidential treatment of such information prior to its disclosure (whether through protective orders or otherwise).

10. INDEMNIFICATION

11. TERM AND TERMINATION

11.4 Termination by Optivision. Should ONI fail to make any payment whatsoever due and payable to Optivision hereunder, Optivision shall have the right to terminate this License Agreement effective on thirty (30) days' notice, unless ONI shall make all such payments to

Optivision within said thirty (30) day period. Upon the expiration of the thirty (30) day period, if ONI shall not have made all such payments to Optivision, the rights, privileges and license granted hereunder shall automatically terminate.

11.5 Termination for Breach, Default. Upon any material breach or default of this License Agreement by ONI other than those occurrences set out in Section 11.4 above, which shall always take precedence over any material breach or default referred to in this Section 11.5(a), Optivision shall have the right to terminate this License Agreement and the rights, privileges and license granted hereunder effective on ninety (90) days' notice to ONI. Such termination shall become automatically effective unless ONI shall have cured any such material breach or default prior to the expiration of the ninety (90) day period.

(b) Upon any material breach or default of this License Agreement by Optivision, ONI shall have the right to terminate this License Agreement and the rights, privileges and license granted hereunder effective on ninety (90) days' notice to Optivision. Such termination shall become automatically effective unless Optivision shall have cured any such material breach or default prior to the expiration of the ninety (90) day period.

11.6 Effects of Insolvency. All rights and licenses granted to a party under or pursuant to this License Agreement are, and shall otherwise be deemed to be, for purposes of Section 365(n) of the U.S. Bankruptcy Code (11 U.S.C. 101, *et seq.*), licenses to rights of "intellectual property" as defined thereunder. Notwithstanding any provision contained herein to the contrary, if a party that is a licensor of intellectual property hereunder is under any proceeding under the Bankruptcy Code and the trustee in bankruptcy of such party, or the party, as a debtor in possession, rightfully elects to reject this License Agreement, the party to whom such intellectual property has been licensed may, in accordance with 11 U.S.C. Section 365(n)(1) and (2), retain any and all rights hereunder granted to it, to the maximum extent permitted by law, subject to the payments, if any, specified herein.

11.7 Effect of Breach or Termination.

11.7.1 Accrued Obligations. Termination of this License Agreement for any reason shall not release any party hereto from any liability which, at the time of such termination, has already accrued to the other party or which is attributable to a period prior to such termination nor preclude either party from pursuing all rights and remedies it may have hereunder or at law or in equity with respect to any breach of this License Agreement.

11.7.2 Return of Materials. Upon any termination of this License Agreement, ONI and Optivision shall promptly return to the other party all Confidential Information received from the other party.

11.8 Survival. Sections 1, 6, 7, 8, 9, 10, 11.7, and 12 shall survive the expiration or termination of this License Agreement for any reason.

12 MISCELLANEOUS

12.1 Governing Law. This License Agreement and any dispute arising from the performance or breach hereof shall be governed by the laws of the United States of America and the State of California, without regard to that state's laws concerning conflicts or choice of laws.

12.2 Waiver. Neither party may waive or release any of its rights or interests in this License Agreement except in writing. The failure of either party to assert a right hereunder or to insist upon compliance with any term or condition of this License Agreement shall not constitute a waiver of that right or excuse a similar subsequent failure to perform any such term or condition.

12.3 Assignment. This License Agreement shall not be assignable by either party to any third party hereto without the written consent of the other party hereto and any such attempt to assign shall be void, provided, however, that ONI shall have the right to assign this License Agreement to a successor to all or substantially all of its assets or business, whether by sale, merger or otherwise. Any permitted assignee or transferee shall agree in writing to comply with all the terms and restrictions contained in this License Agreement.

12.4 Independent Contractors. The relationship of the parties hereto is that of independent contractors. The parties hereto are not deemed to be agents, partners or joint ventures of the others for any purpose as a result of this License Agreement or the transactions contemplated thereby.

12.5 Notices. All notices, requests and other communications hereunder shall be given in writing by certified or registered mail to the addresses set forth below and shall be deemed received on the actual date of receipt:

If to Optivision: Optivision, Inc.
3450 Hillside Avenue
Palo Alto, CA

If to ONI: Optical Networks, Incorporated
3450 Hillside Avenue
Palo Alto, CA

12.6 No Implied Licenses. No rights or licenses with respect to the Licensed Subject Matter are granted or deemed granted hereunder or in connection herewith, other than those rights expressly granted in this License Agreement.

12.7 Complete Agreement. This License Agreement constitutes the entire agreement, both written and oral, between the parties with respect to the subject matter hereof, and all prior agreements respecting the subject matter hereof, either written or oral, expressed or implied, are merged and canceled, and are null and void and of no effect. No amendment or change hereof or addition hereto shall be effective or binding on either of the parties hereto unless reduced to writing and executed by the respective duly authorized representatives of Optivision and ONI.

12.8 Headings. The captions to the sections and paragraphs hereof are not a part of this License Agreement, but are included merely for convenience of reference only and shall not affect its meaning or interpretation.

IN WITNESS WHEREOF, the parties hereto have caused this License Agreement to be duly executed by their authorized representatives as of the Effective Date.

OPTICAL NETWORKS, INCORPORATED

OPTIVISION, INC.

By: James S. Ryker
Name: James S. Ryker
Title: President & CEO

By: James S. Ryker
Name: James S. Ryker
Title: President & CEO

Patent

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ATTACHMENT B

Description of Intellectual Property Assigned to ONI

Section V. Intellectual property contributed to ONI

Patents granted:

U.S. Patent No. 5,515,195, May 7, 1996, "Optical bus using controllable optical devices".

The patent describes a bi-directional optical data bus as well as bus interfaces for applications in high speed optical blackplanes where data is placed or removed from the bus by dynamically controlling optical coupler elements.

Patents Filed:

"Lensed Planar Optical Waveguides for Packaging Optoelectronic Devices."

Filed: June 7, 1995

This patent application describes the process for making self-aligned macro-lenses on the ends of waveguides for applications toward low-cost, higher coupling uniformity, low-complexity packaging for laser arrays or photodetector arrays.

"In-Line Polymeric Construct for Modulators, Filters, Switches and Other Electro-Optic Devices"

Filed: July 16, 1996 (USSN:08/683,056)

Provisional Patent Applications:

"Method and apparatus for simultaneous operation of single and multiple wavelength lightwave communication networks".

Serial No. 60/038, 149 Filed: February 10, 1997 (Townsend and Townsend and Crew, Palo Alto). This provisional patent application consists of over 75 pages of description, diagrams, and documents related to the various concepts, methods, and possible implementations of optical-switching-nodes (OSN) for network restoration. It encompasses a wide area of intellectual property that will be defined with particular claims by February 10, 1998 as a single or multiple patent applications, all retaining the original date of disclosure.

Intellectual Property related to the following (documented, implemented in designs, and projects in progress):

1. Optical Switching and Networks Group.

- Just-In-Time Switching - This signalling protocol is designed to take advantage of fast reconfiguration of optical switches and provides means of achieving high utilization of multi-wavelength optical networks. This protocol is being implemented in the private optical network for DoD as part of the MONET WDM network test-bed in Washington, D.C. This protocol development work along with fast optical switches based on Optivision wavelength selecting and

converting cross-connect switches is also part of a joint proposal to NGI (Next Generation Internet program with the participation of Sprint, Nortel, ISI, and Harvard University.

- Network-Interface-Units (NIUs) for assembling of OC-12, 48 and higher rate ATM/IP/Gigabit Ethernet, other format data in 'super-packets' for transmission in fast reconfigurable optical networks.

- Wavelength-selecting and wavelength-converting optical cross-connect systems (with control units) for fast optical data networks.

- High speed network analyzer core engines for OC-12, 48 and higher rates. The "Merlin" analyzer, designed in cooperation with Los Alamos National Labs, is a modular set of equipment designed to support all aspects of high performance network development, manufacturing, and maintenance. Examples of signal formats available include HIPPI 800 to 6400, ATM/SONET OC-12c, OC-48c, with future upgrades planned for other formats and data rates.

- HIPPI-SONET Gateway: This gateway, available in single and multi-channel versions is designed to provide the required interconnection of two HIPPI networks through SONET fiber. This gateway can be connected to a HIPPI host computer or to a port on a HIPPI network switch. The transport of HIPPI data through SONET is completely transparent to the HIPPI hosts and HIPPI data words can be striped across up to six SONET OC-3c lines. This equipment family also includes HIPPI buffers as well as HIPPI repeaters.

OSN related work

- A concept and implementation of wavelength specified paths in lightwave networks over various fiber topologies with optical switches at nodes.

- Method and means of combination of wavelength multiplexing components and equipment with optical switching to achieve mesh or ring restoration as well as dynamic provisioning (routing) of selected capacity.

- Algorithms for synthesis, analysis, and operation of optically restorable lightwave networks of various topologies.

- Methods and implementations of using optical switching modes for procuring optical paths on demand in large scale optical networks.

- Method and implementation of combining optical switching with configurable optical add-drop multiplexers to achieve dynamic provisioning of capacity and restoration in optical networks.

2. Guided Wave Photonics Group

Single-Mode Array Optoelectronic Packaging

- Unique lensed waveguide approach to packaging of arrays of laser diodes. Low cost and higher performance than existing array packaging techniques.

- Expanded beam packaging using microlens array technology currently being developed.

- Patent filed 6/7/95 entitled "Lensed Planar Optical Waveguides for Packaging Optoelectronic Devices."

- Target applications: WDM optical networks where laser arrays can be used to select one of many wavelengths for transmission.

Parallel Fiber-optic Links

- Ruggedized parallel fiber-optic links currently being developed for NASA. These links provide > 1 Gb/s throughput, and utilize MCM and silicon V-groove technology.
- Target applications: Spacecraft and aircraft networks and busses.

MEMS-Based Fiber-Optic Switches

- Unique optical switching architecture based on MEMS micromirrors allowing optical switches of size 1024 x 1024 or larger to be achieved with reasonable hardware complexity and cost.
- MEMS optical switching experiments at Optivision have provided useful insight into switch implementation issues.
- Details of Optivision's architecture in signed laboratory notebook dated 5/8/97.
- Target applications: Large fiber-optic cross-connect matrices for optical networks.

Polymer Modulators

- Modulators suitable for digital and analog transmission at > 20 Ghz bandwidth.
- Lower cost and lower insertion loss than existing modulators.
- Target applications: Digital transmission systems and CATV.

3. Photonic Interconnects and Processors Group

Free Space Parallel Interconnects

The primary area that may hold IP in the PIP group comes under the broad heading of free space parallel optical interconnects. The group has put together a number of systems and there is likely IP relating to assembly techniques, optical configurations, opto-electro-mechanical systems, architectures for systems, and interconnects constructed using these techniques. There is also unique knowhow relating to high performance cell or packet switch architectures. An extension to the Optivision patent for optical busses was abandoned because of concerns about likely utility, but a new patent for this architecture could be pursued.

Logic Processor Architectures

Optivision is working on a government contract to provide a specialized processor capable of doing logic operations on a cell or packet-based streams of data at rates exceeding 10Gbps. We are likely to have or be about to generate some intellectual property on architectures, methods and optical configuration for performing these functions.

Interconnects for and Testing of 3D optical memories

Optivision has previously done work on architectures for interconnects to high capacity 3D optical memories and is currently working to build test system for these kinds of memories. We are in a position to generate IP relating to the interconnects and Standards for how these devices will be used.

Optical Interconnects for cryogenic electronics

Optivision may have some IP on approaches for providing optical interconnects to cryogenic electronics (primarily for infrared imagers but suitable for other cryoelectronics).

Optivision Photonics Invention Disclosures 12/97

(prepared by Gary C. Bjorklund, 12/31/97)

#	Invention	Inventors	Description/Applications
1	Overlay Operation of Packet Data Network over SONET through Use of Space Division Optical Switching Systems	R. Sharma	Allows graceful addition of IP and ATM packet services without requiring additional SONET ADM equipment
2	Integration of OSN Switch with WDM Terminal	R. Sharma	Allows Integration of switching capability with WDM terminal equipment
3	Combination of Configurable Wavelength Add-Drop Multiplexers with Optical Switching	R. Sharma	Configurable provisioning of wavelengths and capacity
4	OSN Sub-Module	R. Sharma	Enables re-use of protection WDM terminals as regenerators
5	SONET ADM Interoperability	R. Sharma	Enables interoperability with SONET
6	Optical Switching Systems for Procuring Optical Paths on Demand in a Nationwide Telecommunications Network	R. Sharma	Enables DOD customer to establish a secure data path using protection fibers without need for signaling to Telco equipment
7	Merlin Network Analyzer Architecture	J. Parker	Overall approach featuring modular design
8	Merlin Network Analyzer Core Design	J. Parker	Clocked RAM with control FPGAs
9	Fast Reconfiguration of Optical Switches	J. Parker	Fast hardware assisted arbitration in SCU provides switch reconfiguration time 2 to 3 orders of magnitude more rapid than prior art for optical switch network elements
10	MEMS Optical Switch	R. Kalman	A Fourier-based architecture that takes advantage of the small size and integratability of MEMS to provide a large NxN optical switching fabric
11	Fiber Positioning Algorithm	R. Kalman	Algorithm for automated positioning of optical fibers for opto-electronic packaging
12	ATM Switch Architecture	M. Derstine	Architecture for time multiplexed crossbar packet switch that can be implemented using free space digital optics
13	Optical Interconnect Configuration	M. Derstine	Optical configuration of highly parallel optical interconnect between closely spaced electronic boards
14	Microlens Alignment Technique	M. Derstine	Specific implementation of basic idea from McGill U for precision lateral alignment between spatially separated planar surfaces

#	Invention	Inventors	Description/Applications
15	Monolithic Optical Beam Combining Units	M. Derstine	Provides monolithic building block for assembly of free space digital optics systems
16	Optical Logic Processor	M. Derstine	Architectural concepts for systems that can permute data
17	Linearized Directional Coupler Modulator	R. Weverka	Method for designing PILF and other types of modulators with highly linear transfer functions
18	PILF Modulator with Small Core Fiber	R. Weverka	A more efficient PILF modulator design using stronger evanescent coupling
19	PILF Modulator with Low Index Buffer Layer	R. Weverka	A more efficient PILF modulator design using modes near cutoff
20	PILF Modulator with Loss/Gain Modulation in the Overlay	R. Weverka	Uses electrical or optical pumping of gain medium for modulation
21	PILF Modulator with Fiber Grating	R. Weverka	Uses modulation of the polymer index to modulate the effective β in the fiber and change grating center wavelength
22	PILF Modulator with Beat-Frequency Fiber Grating	R. Weverka	Uses low frequency beat-frequency fiber grating to provide $\Delta\beta$ necessary to couple efficiently from fiber to waveguide modes
23	PILF Intracavity Fiber Laser Modulator	R. Weverka	Uses PILF as low insertion loss modulator that can function as an intracavity modulator for lasers or other resonant opto-electronic devices
24	PILF Modulator/Filter with Thermo-Optic Polymer	R. Weverka R. Hill G. Bjorklund	Uses the large index change that can be achieved in polymers through the thermo-optic effect to provide greatly increased PILF tuning range
25	Traveling Wave Detector Based on Fiber Half Coupler Substrate	R. Weverka (Optivision). A. Knoesen (UC Davis)	Uses fiber half coupler substrate to deliver optical power to an array of photodetectors in a phase matched manner
26	High Power Photodetector	R. Hill ? R. Weverka	General scheme for optical fan-out, RF fan-in for distributed photodetectors
27	Efficient MSM Photodetector	R. Hill ? R. Weverka	Use of lenslet arrays and diffractive optical elements to increase the efficiency of MSM photodetectors
28	Variable Optical Delay Line with Increased Resolution	R. Weverka	Use of differential dispersion between two different fibers containing sets of fiber gratings to achieve smaller minimum delay
29	Optical Switch Based on Magneto-Optic Effect	R. Weverka	Use of current controlled magneto-optic crystal element inside of Sagnac Interferometer to provide bias and switching

#	Invention	Inventors	Description/Applications
30	1xN Rotating MEMS Deflector Switch	R. Weverka	Use of optical element mounted on rotating MEMS base to provide controlled angular deflection for 1xN switch

ATTACHMENT C

OPTIVISION GOVERNMENT CONTRACTS ACTIVE 1/7/98

Organization	Start	End	#	Status	Title	Contract #
ONR	7/12/95	6/29/98	95-159	A	High Speed In-Line Modulators for Photonic Array Antenna Subsystems	ND0014-95-C-0187
ARPA/ASTO	8/16/95	4/15/98	95-165	A	IFOG Light Source and Integrated Optics Chip Package	DAA1101-95-C-R187
TRP	5/17/96	8/31/98	96-175	A	Diffraction Optics Technology for Battlefield Management Systems	DAA1107-06-3-J016
DoD	7/23/96	5/31/99	96-198	A	Optical Crossbar Network Enhancement and Interconnection w/ MONET TD	MDA904-96-C-1030
E-Systems	8/22/96	8/10/97	96-178	A	Super IIPPI Tester	PO HAP0000151
DoD	9/28/96	10/28/98	96-110	A	Optical Logic Processor Demonstration, Phase II	MDA904-96-C-1347
NASA/JPL	12/2/96	12/1/98	96-111	A	Highly Survivable Multi-Fiber Optic Interconnection Networks	NAS8-97049
Air Force	3/28/97	2/28/99	97-304	A	Novel Electro-Optical Polymers for In-Line Fiber Photonics Devices	F33615-97-C-3479
Air Force	4/1/97	4/1/99	97-305	A	Next Generation Mass Memory Performance Analyzer	F30602-97-C-0096
Northrup Grumman	9/1/97	9/30/98	97-309	A	Free Space Optical Interconnect Accelerator	04111-TC-981400V
AFOSR	4/1/97	4/1/99	97-310	A	Dev't of Highly Active Electro-Optic Polymers for In-Line Fiber Photonic Devices	FQ8671-9701638
NSF	10/1/97	9/30/99	97-313	A	New Architectures & Appl of Multiwavelength Optical Networks using Waveguide	DMI-9704126
Univ of Colorado	8/15/97	8/14/98	97-315	A	Photonics for RF Array Processing	NS0057329
TRW	12/23/98	TDD	97-320	A	Parallel Fiber Optic Data Bus Component Fabrication Program	Letter Contract No. 890961H071.
LANL	4/23/96	TDD		A	Cooperative Research and Development Agreement	WLA96C10280

WLR:ONMA/PCDOC/SQ/L2M349811